



# EXPERIMENT STATION RECORD.

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Printed in scientific and technical publications outside the Department.



## EXPERIMENT STATION RECORD.

N. 33.

JUNE, 1918.

No. 8.

From time to time reference has been made in these columns to the progress and development of the International Institute of Agriculture at Rome. This unique institution, conceived to bring together the nations of the world for the advancement of agricultural interests through cooperative endeavor, has been from its inception a very interesting undertaking. Organized after many discouragements and delays, and regarded even after its establishment with some skepticism, it has entered upon a number of important fields of service and has demonstrated its capacity for usefulness in many directions.

The Institute has now completed its first decade of active operations. Much of this period has been necessarily devoted to problems of organization. The number of countries supporting it financially has been increased from forty to fifty-six, representing fully ninety-eight per cent of the entire population of the world. To enlist and obtain the cooperation and support of these nations for so novel an enterprise has been in itself no small achievement. In addition a permanent organization has been effected, a staff of about one hundred regular employees has been built up, several series of publications established, and tangible progress made on numerous projects of importance.

It will be recalled by those familiar with the history of the Institute that responsibility for its establishment belongs primarily to two men. The idea originated with an American, Mr. David Lubin, of California, who has from the beginning remained the representative of the United States on the permanent committee. In carrying the project into effect, Mr. Lubin obtained the active support of King Victor Emmanuel of Italy, upon whose invitation an international conference was held in Rome in 1905. This conference formulated a treaty under which, upon the ratification of the various nations, the Institute was permanently located in Rome.

The king erected a palace in 1908 as the headquarters of the Institute, and provided an annual fund of about \$60,000 toward its support. The greater part of its budget, however, is supplied by the adhering nations on a cooperative basis from subscriptions ranging

from \$500 to \$8,000 each per year. Additional appropriations are made by many nations for the translation of the publications from French, the official language of the Institute, into their respective tongues. Some revenue is also obtained from the investment of the accumulated reserve funds and the sale of publications. The total income is normally about \$250,000 per annum. Of this amount the United States now contributes \$16,600, of which \$5,000 is toward the publication of English editions and the remainder for the payment of its subscription quota and the maintenance of a permanent representative.

The management of the Institute is intrusted to two bodies, a governing board known as the general assembly, and an executive board termed the permanent committee. The delegates to both these bodies are chosen by the respective governments, thus making the Institute distinctly an international enterprise. The general assembly was expected to meet about once in two years for sessions of about a week's duration to vote the budget, review and approve the work of the permanent committee, and authorize changes desired in the plan and methods of work, but on account of the war conditions no meeting has been held since 1913. The permanent committee, however, which comprises the permanent resident representatives of the various nations, has continued to meet about once a month and to administer the affairs of the Institute along substantially the usual lines.

The original aim in founding the Institute is well set forth in a letter of King Victor Emmanuel in 1905, advocating its establishment, as follows: "Farmers, who generally form the most numerous class in a country and have everywhere a great influence on the destinies of nations, can not, if they remain isolated, make sufficient provision for the improvement of the various crops and their distribution in proportion to the needs of consumers, nor protect their own interests on the market, which, as far as the more important produce of the soil is concerned, is tending to become more and more one market for the whole world. Therefore, considerable advantage might be derived from an international institute, which, with no political object, would undertake to study the conditions of agriculture in the various countries of the world, periodically publishing reports on the amount and character of the crops, so as to facilitate production, render commerce less expensive and more rapid, and establish more suitable prices. This institute, coming to an understanding with the various national offices already existing for the purpose, would also supply information on the conditions of agricultural labor in various localities, so as to serve as a safe and useful guide for emigrants; promote agreements for mutual defence against diseases of plants and animals, where individual action is insufficient.

and, finally, would exercise an action favorable to the development of rural cooperation, agricultural insurance, and credit." Most of the objects set forth in this letter were embodied in the treaty of 1905, which constitutes its basis of operations.

The work of the Institute is now organized under four bureaus. These consist of the General Secretary's Department and Library, and the Bureaus of General Statistics, Agricultural Intelligence and Plant Diseases, and Agricultural Economics. Mention should also be made of the four permanent commissions corresponding to the bureaus. These commissions serve as advisory bodies to the respective bureaus, while their presidents, together with the president and vice-president of the Institute, form a special committee to deal with many matters of administration. A number of special commissions have also been created from time to time. The permanent staff of employees consists mainly of abstractors, statisticians, and translators, and usually represents from ten to twelve nationalities.

The General Secretary's Office is largely administrative, but also includes the Library and the Bureau of Agricultural Legislation. The Library is, of course, an important feature of the Institute. It has now been organized eight years and consists of about 70,000 volumes dealing with agriculture, the natural and social sciences, etc., of the various countries. Nearly 2,700 periodicals are normally received, special efforts being made to secure those dealing with agricultural economics and statistics. It is thus already among the largest agricultural libraries in existence, and it is expected to build it up much more extensively at the close of the war.

The Bureau of Agricultural Legislation began work in 1911 and has since published annually an *International Yearbook of Agricultural Legislation*. This volume contains the texts of the most important enactments of the year and bibliographical references to many others of less significance. It constitutes a most useful compilation of material not otherwise assembled and most difficult of access. The preparation of a five-year index to this legislation was approved in 1916, but its execution has been postponed until the close of the war.

The Institute has been from the beginning particularly interested in the production of statistical information as to crop and market conditions. It has realized the great advantage to farmers and to others of complete and authoritative information as to the state of the world crops, the estimated and actual harvest, wholesale and retail prices and their fluctuations, trade movements, and similar factors. The obtaining of such information obviously presupposes the existence of adequate crop reporting machinery within the various nations, and the provision of such machinery is a national and not an

international problem. The Institute has, however, endeavored through its permanent committee and general assembly to bring about an improvement in this direction and considerable progress is reported. It is announced that the agricultural statistical service in several countries has been organized entirely or in part on the basis recommended by the Institute, and that in a number of others greater uniformity in methods of reporting data has been secured.

The statistical work of the Institute is centered in the Bureau of General Statistics. This bureau has published monthly since 1911 the *Bulletin of Agricultural and Commercial Statistics*, each number now averaging about forty pages and issued in French, English, German, Italian, and Spanish editions. It constitutes a monthly international compilation of data furnished by the respective countries as to the most important crops, and despite many difficulties and limitations, supplies much data not previously available in so complete a form. During the present year a supplementary series, known as *Documentary Leaflets*, has been added, these comprising data on miscellaneous agricultural projects of tropical countries. Two semi-annual reviews are prepared, one dealing with the statistics of cereals and the other with the international movement of fertilizers and chemicals useful to agriculture. Most of these data, together with other information, are subsequently assembled into the voluminous *International Annual of Agricultural Statistics*. Several monographs dealing with special phases of statistical work have also been issued. Among them may be mentioned *Les bases théoriques de la statistique agricole internationale*, published in 1914, which discusses in detail the principles to be followed in organizing agricultural statistical services.

As a recent statement by the Institute points out, "an international institute of agriculture can not be conceived which has no service designed to supply the nations with information of every sort regarding the increasing progress along technical lines in every branch of agriculture." This essential function is intrusted to the Bureau of Agricultural Intelligence and Plant Diseases. This Bureau publishes a monthly abstract journal in five languages, as well as monographs on current questions from time to time.

The abstract journal, which has special interest to readers of the *Record*, was established in 1910 under the name of the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, but has recently been rechristened the *International Review of the Science and Practice of Agriculture*. Originally it contained both abstracts and original articles, but of late it has restricted itself to the abstracting of current literature. It is stated that about 1,000 publications are regularly abstracted, and from 1,300 to 1,400 abstracts are published

last year. This number is of course much smaller than that for the *Record*, which in recent years has abstracted from 7,000 to 8,000 articles annually. The point of view is also somewhat different, one leading aim being to supply information directly to farmers. Many of the publications received by the Institute are not available in this country, particularly since the outbreak of the war, and most timely assistance has thus been rendered in making their contents available to scientific workers. The *Record* welcomes this opportunity to acknowledge its appreciation of this assistance.

Special arrangements have been made by the Institute with the Dominion of Canada, whereby in recent years many of the abstracts in the *Review* have been reprinted in the original or condensed form in the *Agricultural Gazette*, the official publication of the Canadian Department of Agriculture. The recently established official *Journal of the Board of Agriculture of Scotland* has also been aiding in the further dissemination of the information provided by the *Review*.

Three monographs have thus far been prepared by the Bureau of Agricultural Intelligence and Plant Diseases. These deal respectively with the organization of the services for the control of plant diseases and insect pests in the various countries, the production and consumption of chemical manures in the world, and the campaign against locusts in several regions.

The fourth division of the Institute is the Bureau of Economic and Social Intelligence. This bureau deals, as its name implies, with questions of rural economics and sociology, giving special prominence thus far to agricultural cooperation, credit, insurance, and legislative measures. Its publications correspond in a general way to those of the Bureau of Agricultural Intelligence and Plant Diseases. Its monthly periodical, however, the title of which was recently changed to the *International Review of Agricultural Economics*, consists chiefly of original articles on current economic questions. The monographs have dealt with the status of agricultural cooperation in the principal European countries, hail insurance and some of its problems, the organization of the statistics of agricultural cooperation in certain countries, and an outline of European cooperative credit systems. The last-named publication was reprinted in this country as a public document and received wide dissemination during the discussion of the Federal Farm Loan Act.

Each of the bureaus prepares short communications for the press. Brief abstracts are given of the contents of the various bulletins, crop summaries, and other important data. The Bureau of Economic and Social Intelligence issues monthly, in five languages, leaflets of from four to six pages summarizing its longer articles for use of the press. The various press leaflets are widely distributed, par-



ticularly to the agricultural press of the world, and have proved very successful in securing extensive dissemination of the findings of the Institute.

In addition to the service rendered by its publications, the Institute is empowered under the treaty of establishment to submit to the various governments "measures for the protection of the common interests of farmers and for the improvement of their conditions." This function has been attempted in several directions.

Reference has already been made to efforts to standardize crop statistical reports. As one step along this line the Institute has advocated the general employment of the metric system. The introduction of dry farming practices employed in this country has been suggested to various other nations, and it is stated that the suggestion has met with favorable response in Hungary, Russia, Italy, Spain, Greece, Algeria, and Tunis.

The international protection of birds useful to agriculture, hail insurance and other meteorological problems extending far beyond national boundaries, and the combating of the spread of locusts may be cited as other features of endeavor. The Institute suggested the holding of the International Congress of Phytopathology, which met in Rome in 1914, and has proposed to the International Meteorological Committee the formulation of a program of an international service of agricultural meteorology.

The operations of the Institute have been, of course, profoundly affected by the war. At the beginning of hostilities its very existence seemed dubious. As its vice-president, M. Louis-Dop, has pointed out in a recent report reviewing its history and progress, the question was immediately raised as to the possibility of maintaining, in a conflict which has transformed the political and economic conditions of every continent, an organization based upon the collaboration of nations, the working together of a committee representing all the powers, belligerent or neutral, and the efforts of a personnel of international composition. Notwithstanding these obstacles, the continuation of the enterprise was decided upon. Apparently it was felt that the Institute had been established as a permanent institution and the suspension of its operations should be avoided if possible. More than this, it was expected that the usefulness of the Institute to the world would be in many ways intensified by the war conditions. The work of the Institute has, therefore, been carried on so far as possible. No nation has abrogated the treaty, so that all are full members as before. Meetings of the permanent committees have been held regularly, and each of the bureaux has been performing

its functions much as in 1914, although crop reports and similar data have been withheld by the Central Powers.

The immediate result of the war upon the Institute has been on the whole to increase and stimulate its activities. The need for accurate statistical data regarding the world's food supply has never been so urgent. Information as to improved farm methods and economic measures has been eagerly sought for and with more prospect than ever before of its practical utilization. As regards technical material, particular efforts have been made to render available data as to means of diminishing the impoverishment of the soil, overcoming the shortage of fertilizers and labor, and increasing the use of farm machinery. A special function has been the answering of inquiries regarding agriculture in countries whose own agricultural and statistical departments have been disorganized by the war. It is announced that these various efforts of the Institute have met with unusual appreciation from the governing authorities of many nations.

The officers of the Institute are also looking forward quite optimistically to the future of the institution after the war. They believe that the return of peace will bring with it vast agricultural problems of international significance, and that during the reconstruction period the Institute will have a specially important function to perform. There will be a great demand for accurate information along statistical, economic, and technical lines, much of it international in its scope, and for the collection and dissemination of which a central clearing-house, such as this, will have unique possibilities. The Institute is already making plans for service in these directions, and more specifically in such projects as the control of locusts, the improvement of the economic status of the farmer, the establishment and development of small holdings, maritime transportation of farm products, the unification of methods for agricultural statistics, farm accounting, control of seed adulteration, and concentrated feeding stuffs, and the development of rural sociology.

Despite the unexpectedly difficult problems it has encountered, the Institute thus enters upon the second decade of its operations with its organization virtually intact, its publications and other lines of work going on with little interruption, and an ambitious program being formulated for the future.

## RECENT WORK IN AGRICULTURAL SCIENCE

### AGRICULTURAL CHEMISTRY—AGROTECHNY.

The physical chemistry of the proteins, T. B. ROBERTSON (*New York and London: Longmans, Green & Co., 1918, pp. XV+483, figs. 7*).—This is a new edition in English of the book previously noted (*E. S. R.*, 20, p. 408), and has been almost entirely rewritten and enlarged to include the literature on the subject through the middle of 1917.

In the introduction the author comments upon the development of two rather sharply differentiated schools of opinion in regard to proteins and colloids in general. "The one school endeavors, so far as technical difficulties permit, to apply directly, with modifications suggested by the properties and structure of the particular colloid under investigation, the known laws of what may be termed 'molecular' physical chemistry to protein and other colloidal systems, while the other school hesitates to do so." The author claims allegiance to the former school, and in this work endeavors to interpret the physico-chemical behavior of the proteins in the light of the laws of Boyle and Gay-Lussac as applied to solutions by van't Hoff and of the Guldberg and Waage mass-law. He has assumed the validity in protein systems of the first and second laws of heat, and in considering the electrochemical behavior of proteins the applicability of Arrhenius' hypothesis of electrolytic dissociation, of Kolrausch's law of the independent motion of ions, of the Nernst theory of concentration cells, and the applicability of the Guldberg and Waage mass-law to reactions between ions.

The book contains an extensive bibliography and an appendix in which the author's technique of electrochemical measurements in protein systems is explained.

A detailed method for the preparation of histidin, H. M. JONES (*Jour. Biol. Chem.*, 33 (1918), No. 3, pp. 429-431).—The author describes in detail a method for the preparation of histidin from the so-called "blood paste," a concentrated suspension of red blood corpuscles obtained by centrifuging defibrinated or blood. The method is a more detailed statement of the one already in use and emphasizes certain apparently insignificant steps in the process which are easily overlooked.

The distillation of cellulose and starch in vacuo, A. PICTET and J. SARAGNY (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 1, pp. 58, 59).—The distillation of cellulose under a pressure of 12 to 15 mm. results in the formation at a temperature of between 200 to 300° C. of a thick yellow oil which soon changes to a pasty semicrystalline mass. Purification by recrystallization from boiling acetone or water gives a white anhydrous crystalline substance very soluble in water, alcohol, acetone, and acetic acid, and almost insoluble in other organic solvents. The water solution is neutral to litmus and both sweet and bitter to the taste. It does not distill without decomposition at ordinary pressure. It reacts readily with acetyl and benzoyl chlorides, giving triacetyl and tribenzoyl derivatives.

The properties of the substance agree closely with those of levoglucosane, an hydrolysis product of certain glucosids. Starch and dextrin also yield the same product when distilled under reduced pressure, indicating that it is possibly the primary hydrolysis product of carbohydrates in general.

The enzymes which are concerned in the decomposition of glucose and mannitol by *Bacillus coli communis*, I-III, E. C. GARY (*Proc. Roy. Soc. [London]*, Ser. B, 87 (1914), No. B 597, pp. 472-484, fig. 1; 90 (1918), No. B 625, pp. 75-86, fig. 5).—Part 1 of this paper deals with the action on glucose and mannitol in the presence of peptone of two artificially selected strains of *B. coli communis* obtained by growth of normal *B. coli communis* on agar containing sodium chloracetate.

It was found that the selected strains produced from glucose lactic acid in relatively greater, and alcohol, acetic and formic acids in relatively less, proportion than did the original strains, while from mannitol there was no diminution in the production of alcohol and acetic and formic acids. It is concluded that the artificially selected strains have not lost the enzymes which bring about the main reaction in the production of alcohol and acetic acid, but that a diminution of the reducing mechanism of the cell has resulted so that some intermediate substance from which formic acid and the precursor of alcohol and acetic acid are derived can not be readily decomposed.

Part 2 reports experiments of short duration with an emulsion of the organisms similar to those above with the exception of the omission of peptone. A greater proportion of alcohol, acetic acid, and succinic acid and a smaller proportion of lactic acid were obtained.

The results of the experiments show that (1) succinic acid has an origin in common with acetic acid and alcohol, (2) the formation of lactic acid is independent of the formation of the above products, and (3) the enzymes which effect the decomposition of glucose also cooperate in the decomposition of mannitol.

The author concludes that the fermentation of various carbohydrates and allied substances by bacteria is brought about by a single set of enzymes whose actions are common to all such cases of fermentation. It is possible that the first step in the degradation of a particular molecular structure may require a special enzyme in order to produce the first intermediate substance which would be the same for all analogous cases of fermentation.

Part 3 deals with various phases in the decomposition of glucose by an emulsion of the organisms. The products resulting at different stages in the decomposition of glucose by *B. coli communis* were analyzed with the following results: During the period characterized by the rapid death of the cells there was no formation of lactic acid, the sugar being transformed into alcohol and formic, acetic, and succinic acids. During the period of multiplication there was a transformation of glucose into a more complex substance, and in the period immediately following lactic acid was produced to the extent of 70 per cent of the sugar consumed. The independent existence of enzymes in the cell has been shown by the fact that the amount of sugar decomposed during the rapid diminution in the number of cells was as great as during the growth of the cells and by the fact that the several fermentation phenomena are independent of one another.

Studies on enzyme action.—XIV, Further experiments on lipolytic actions, K. G. FALK (*Jour. Biol. Chem.*, 31 (1917), No. 1, pp. 97-123).—Continuing the studies previously noted (*El. S. R.*, 34, p. 111), a systematic investigation of the factors which control the loss or destruction of the activity of the ester-hydrolyzing enzymes or lipases was undertaken.

"The inactivation of esterase and lipase preparations by acids, bases, neutral salts, alcohols, acetone, esters, and heat led to the hypothesis that the active enzym grouping in these substances possessed the enol-lactim structure,  $-C(OH)=N-$ , which became inactive by tautomerization to the keto-lactam structure,  $-CO-NH-$ . This hypothesis was tested by studying the actions of such groupings in dipeptides and an imido ester."

It was shown that "in the presence of simple peptides, esters are hydrolyzed under conditions which favor the production in the former of the enol-lactim grouping, that ethyl imidobenzoate, having the enol-lactim structure, possesses marked ester-hydrolyzing action as well as certain properties strikingly analogous to those of the naturally occurring lipolytic enzymes, and finally that, under conditions under which the occurrence or formation of the enol-lactim structure might be expected (action of alkali), ester-hydrolyzing substances are produced from proteins."

The method of specific coagulation applied to the ferments of the pancreatic juice, E. S. LONDON and E. P. PAKHOTINA (*Compt. Rend. Soc. Biol. [Paris]*, 80 (1917), No. 15, pp. 758, 759; *abs. in Chem. Abs.*, 12 (1918), No. 1, p. 47).—By fractionating a mixture of the ferments of pancreatic juice by successive treatments with ammonium sulphate ions according to the principle outlined on page 786, the authors were able to obtain a successive precipitation of the different ferments. The amylolytic ferment was precipitated first at a concentration of ammonium sulphate of 20 gm. per 100, the proteolytic next at 30 gm. per 100, and the lipolytic last at almost 50 gm. per 100.

Improvements in bacteriological media.—I, A new and efficient substitute for "nutrose," R. L. M. WALLIS (*Indian Jour. Med. Research*, 4 (1917), No. 4, pp. 786-796; *Agr. Jour. India*, 12 (1917), No. 4, pp. 621-632; *abs. in Chem. Abs.*, 12 (1918), No. 5, p. 493).—The new substitute for "nutrose" is composed of 94 parts peanut flour, 5 parts casein, and 1 part sodium carbonate. The product consists of a very finely divided white powder with a sweet taste and a neutral reaction. Its solution in hot water gives a faint opalescence due to the fat still remaining in the peanut flour. Used in the Conradi-Drigalski culture medium, it gives a transparent medium on which organisms of the typhoid-coli group grow very rapidly. The property of stimulating the growth of organisms is apparently due to the presence of a "vitamin" associated with the globulin of the peanut flour.

The author states that combined with egg white and a little salt the new nutrose makes an excellent diabetic bread of high protein and low carbohydrate content.

A method for the preparation of uniform collodion membranes for dialysis. C. J. FARMER (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 447-453, fig. 1).—An apparatus is described by means of which uniform collodion dialyzing membranes may be made. The permeability and time of dialysis may be established by standardization with phosphate mixtures and may be changed by varying the period of drying.

Oxidation of ammonia to oxids of nitrogen, W. G. ADAM (*Chem. Trade Jour.*, 62 (1918), No. 1606, pp. 181, 182, fig. 1).—A commercial converter is described capable of producing one ton of nitric acid every 24 hours from synthetic ammonia. The converter consists essentially of an aluminum box containing a window for observation and having four close layers of platinum gauze held by asbestos rings between aluminum flanges. The lighting up of the catalyst is obtained by means of an electrically heated platinum spiral inserted in the mixture of ammonia and air in close contact with the catalyst, a mixture richer in ammonia being passed for a few seconds until the catalyst is sufficiently hot to

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continue the action. With the thickness secured by four layers of the gauze, and the correct flow by gas, the heat developed is sufficient to maintain the catalyst at the correct temperature after the action has started. Less than four layers allows a slip of ammonia through the catalyst.

The preparation of cyanamid, A. E. OSTERBERG and E. C. KENDALL (*Jour. Ind. Chem.*, 32 (1917), No. 3, pp. 297, 298).—A method by which cyanamid may be easily obtained in a high state of purity is described as follows:

Two hundred gm. of calcium cyanamid are mixed in a 3-liter flask with 1,500 cc. of distilled water. Into this mixture carbon dioxide is passed until the reaction is neutral or only slightly alkaline. The temperature should be kept below 60° C. to prevent polymerization. The precipitate is then filtered on a Buchner funnel and washed with water. The filtrate is placed in a 3-liter flask, a small amount of calcium added, and the solution concentrated by distillation on a water bath in vacuo until a solid crystalline mass is formed on cooling under cold water. This is extracted three times with ether, the ether distilled off on a water bath, and the remaining solution concentrated over sulphuric acid in vacuo. The method gives a yield of 92 per cent of the theoretical.

Dried blood in agriculture; its importance and researches on its adulteration, M. SIMON and G. JOUET (*Ann. Sci. Agron.*, 4. ser., 5 (1916), No. 10-12, pp. 173-195).—The authors emphasize the importance of detecting adulteration in dried blood, describe the usual methods of preparing blood and roasted leather for fertilizers, and discuss the detection of adulteration in dried blood by the microscopic method, its general characteristics, tannin content, and proximate analysis.

The most common adulterant of dried blood is roasted leather meal, which, from the point of view of rapidity of assimilation of nitrogen, is of very little value compared with dried blood. Detection of this adulterant is difficult by microscopic examination on account of the presence in a poorly prepared blood of particles closely resembling those in leather meal. Pure samples of dried blood and of leather meal can be differentiated by their general appearance, odor, and behavior on heating, but in a mixture of the two the tannin test is the best indication of the presence of the leather meal.

Tables are given of the content of nitrogen, moisture, ash, total organic matter, and protein in pure dried blood, leather meal, dried meat, dried horn, and other fertilizers. The difference between the total organic matter and protein is a useful factor in detecting adulteration of dried blood, for the pure blood gives a value of from 0 to 3.5, while in adulterated bloods the values are considerably above 3.5. Composite fertilizers sold under the name of organic fertilizers and characterized by mixtures of mineral superphosphates and organic nitrogen in the form of blood, leather, or dried meat have been examined and the amount of leather determined by this factor.

In 112 samples of dried-blood fertilizers examined by the authors from September, 1913, to March, 1917, 46 were adulterated, those by leather alone exceeding 26 per cent. Attention is called to the importance of determining in a fertilizer not only the amount of nitrogen but its nature.

The ratio of total nitrogen to soluble nitrogen in flour, E. ROUSSEAU and M. SIMON (*Ann. Patisf.*, 10 (1917), No. 109-110, pp. 556-560).—Continuing investigations previously noted (*E. S. R.*, 31, p. 800), the authors have determined the ratio of total to soluble nitrogen in several varieties of flour with particular reference to the baking quality of the flour. The following results were obtained: Flour with extraction value below 70 per cent, 5.73; extraction value above 70 per cent, 6.2 to 7.3; American flour rich in gluten, 7.8 to 8; suspended flour, 1.6 to 5; corn flour, 5.5; rye, 4.4; a mixture of 15 per cent rye and

85 per cent wheat, 5.57; bean flour, 8.2; rice flour, 23.6; 10 per cent rice and 90 per cent wheat, 7.75. Addition of limewater to an inferior flour gives a lower nitrogen ratio and improves the baking quality.

The authors conclude that a too great disproportion between total and soluble nitrogen corresponds to difficulties in baking, and that the action is most favorable when the nitrogen ratio is in the vicinity of 6. The determination is of practical interest in indicating the proportions of different flours necessary to produce the best results in baking.

The soluble nitrogenous matter as an index of the baking value of flour. ROUSSEAU and SIKOR (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 4, pp. 190-192; *Ann. Chim. Analyt.*, 23 (1918), No. 3, pp. 50-55).—Substantially noted above.

The catalase activity of American wheat flours, C. H. BAILEY (*Jour. Biol. Chem.*, 32 (1917), No. 3, pp. 539-545, fig. 1).—The author at the Minnesota Experiment Station has investigated the relationship between the catalase activity and grade of American wheat flours with a view to the practicability of utilizing this test in distinguishing between different grades of flour. Four series of samples from different mills in Minnesota were tested, including samples of patent, straight, first clear, and second clear flours. The method employed was as follows:

One gm. of flour was placed in a mortar and triturated with about 25 cc. of distilled water and then washed into a bottle with 75 cc. of water. The bottle was connected with a eudiometer and a separatory funnel, through which, after the water level in the eudiometer had been brought to zero, 5 cc. of a perhydrol (30 per cent  $H_2O_2$ ) solution was admitted to the flour suspension. The first reading of the evolved gas was made at the end of 30 minutes, the second and last at the end of an hour.

Tables are given showing the source and grade of the samples, their ash content, and catalase activity expressed in terms of cubic centimeters of oxygen evolved in 30 and 60 minutes with a 1 gm. charge of flour. The results show a close but not exact parallelism between the percentage of ash and the quantity of oxygen evolved. The catalase activity increases at a more rapid rate than the percentage of ash, which is of distinct advantage in distinguishing between the various grades of flour. An additional advantage of this procedure is that it can be made in shorter time and with less expensive apparatus than the ash determination. The author considers the test to be of considerable value in indicating the grade of flour.

Wheat bran, its substitution and adulterations, E. COLLIN (*Ann. Pâtis.*, 10 (1917), No. 109-110, pp. 539-554, figs. 12).—This article describes the physical, chemical, and microscopic characteristics of wheat bran and of the various substances used to adulterate it, such as the husks of various cereals, cornstarch, peanut shells, sawdust, and mineral matter, as sand, chalk, etc. Attention is called especially to the occasional presence in commercial bran of castor-bean meal, which is exceedingly poisonous to animals.

Poisonous bread and flour: Characterization and determination of saponotoxins, L. STÖCKLIN (*Ann. Falsif.*, 10 (1917), No. 109-110, pp. 561-572, fig. 3).—Attention is called to the possible presence in flour not highly milled of poisonous grains, particularly fennel, which can be eliminated from wheat only with great difficulty. The presence of fennel in flour may cause the war bread made from the flour to be injurious to the health on account of the saponotoxins contained in it.

The author reviews the chemical and physical properties of the saponotoxins and describes a method of detecting their presence in flour by means of their hemolyzing action on blood. The materials employed for the reaction are as

artificial physiological solution of sodium chlorid and a 10 per cent blood emulsion. The flour to be examined is extracted with ether to remove the fat, and the saponoxins are subsequently extracted by the physiological salt solution. The clear filtrate containing the saponoxins is treated with 0.5 cc. of the blood emulsion and the time of hemolysis noted. Using fresh ox blood, a content of 6 to 8 per cent of fennel produces hemolysis in 35 to 45 seconds, 2 per cent in about 2 minutes, and 0.2 per cent after 2 hours. The author considers as "frankly toxic" a flour which, under the experimental conditions noted, hemolyzes within a minute; as "injurious to the health" within 15 minutes; and as "dangerous" or "suspected" up to 2 hours.

The rapidity of the hemolysis depends not only on the concentration of the saponoxins but also on the temperature of the reaction, the nature of the blood, and the age of the blood emulsion. Diagrams are given showing the time of hemolysis with pure saponins at a temperature of 17° C., and with extractions of flour mixed with known proportions of fennel, using fresh ox blood for the hemolysis.

On the estimation of amino-acid nitrogen in the blood, S. OKADA (*Jour. Biol. Chem.*, 33 (1918), No. 2, pp. 325-331).—The author describes a modification of Bock's process (*E. S. R.*, 37, p. 14) for the removal of proteins in the Van Slyke nitrous acid method for the determination of amino acids in blood. After coagulation of the blood at boiling temperature in weakly acid solution, the filtrate is thoroughly shaken with knolin (20 gm. per 100 cc.) and immediately filtered through a folded filter. The first portion of the filtrate is usually cloudy, but on refiltering through the same filter a clear filtrate is obtained giving no turbidity or precipitation with trichloroacetic acid or picric acid and no biuret action. The filtrate rarely exhibits any tendency to froth.

Experimental data comparing the various methods of precipitation show no appreciable differences in results between this method and the heat-trichloroacetic precipitation method of Bock, but the new method is recommended as being "accurate, less troublesome, saving in time, and economical."

A rapid colorimetric method for estimating glucose in urine, V. I. ISAACSON (*Jour. Lab. and Clin. Med.*, 3 (1918), No. 5, pp. 289-294, figs. 2).—In this new method the amount of alkaline-copper sulphate solution reduced by the glucose is computed indirectly by determining with the aid of a colorimeter the amount left unreduced. The solutions used and methods employed are described in detail.

Italian turpentine, I-III (*Ann. R. Ist. Sup. Foreste Naz. Firenze*, 2 (1916-17), pp. 155-181, fig. 1; 182-189; 190-202; *Ann. Chim. Appl. [Rome]*, 6 (1916), No. 5-8, pp. 135-153; 7 (1917), No. 1-4, pp. 88-94; *abs. in Chem. Abs.*, 11 (1917), Nos. 1, pp. 97, 98; 12, pp. 1911, 1912).—Three studies are reported.

I. *Essential oil of turpentine of Pinus pinca*, F. C. Palazzo. Extensive studies are reported of the oil obtained from *P. pinca* with a view to its production and commercial use. As is true of other varieties of the *Pinus* family a high percentage of  $\alpha$ -pinene was obtained. The fraction distilling from 175 to 180° C. was practically all  $\beta$ -limonene. Distillation of the oil gathered at different times of the year showed a marked variation due partly to climatic conditions, the largest amount of essence being obtained generally in April.

The author emphasizes the value of this essence of turpentine as a new source of  $\beta$ -limonene, which has a commercial use in the manufacture of artificial ethers, perfumed soaps, and varnishes, and on account of its high solubility in 90 per cent alcohol, high inflammability, and pleasant odor. It is claimed that it has a beneficent physiological action in cases of tuberculosis, and that its continued inhalation does not cause headache, vertigo, nor kidney affections.



II. *Italian turpentine from Pinus pinaster*, Mina Palazzo.—Analyses are reported of an industrial turpentine oil from *P. pinaster*, and also of an industrial turpentine oil produced in Italy consisting of a mixture of the turpentines of the maritime and domestic pines and varying in its composition according to the proportions of the two constituents. The oil contained 2.35 per cent resin and colophony oils as adulterants.

III. *Applications of the essence of turpentine from the domestic pine*, F. C. Palazzo and E. Azzarello.—Further studies of the properties of the essence of turpentine from the domestic pine (*P. pinus*) are reported. The drying power of the oil in enamels, varnishes, and paints compares favorably with that of the commercial oil of turpentine and technical limonene. Its notable solvent power for many substances combined with its high flame test make it a valuable solvent. Inhalation of the vapor does not produce the narcotic effect of the ordinary oil of turpentine.

Fats and fatty acids from petroleum, R. J. Moore and G. Eglory (*Metalurgy and Chem. Engin.*, 18 (1918), No. 6, pp. 308-311, fig. 1; *Oil, Paint and Drug Reporter*, 93 (1918), No. 18, pp. 59, 60).—This paper shows the extent to which the synthetic production of fats and fatty acids from hydrocarbons present in petroleum oil has been successful. The past work on the subject is reviewed under the following methods: (1) Through halogenation of aliphatic hydrocarbons, (2) by way of Grignard's reaction, (3) by way of naphthenes, and (4) through direct oxidation of paraffins or olefins. Preliminary experiments have been conducted by the authors of passing vaporized kerosene and chlorine after heating into an electrical silent discharge field of high potential, adding carbon dioxide at the same time. Indications are that a certain amount of fatty acids is formed under these conditions.

Data in regard to a new oil extracted from *Blepharocalyx gigantea* (Horcomolle), F. Zelada (*An. Soc. Quim. Argentina*, 5 (1917), No. 21, pp. 226-237, figs. 3; *Univ. Tucumán, Inform. Dept. Invest. Indus.*, 1917, pp. 5-13, figs. 3).—A study of the Horco-molle, a tree which grows abundantly in Tucumán, within the subtropical zone, showed that from it could be extracted a new oil which because of its agreeable aroma and easy extraction, could be incorporated into perfumes. The botanical and histological properties of the tree are summarized and the following analytical constants given:

Density at 15° C., 0.9188; boiling point at 760 mm., 169.9°; specific rotation at 28°, -2° 22'; index of refraction at 27.5°, 1.4732; solubility in 80 per cent alcohol 6.1, in 90 per cent alcohol 3.7; saponification number, 56 mg.; percentage of ether, 18.164; percentage of alcohols, 15.66; acetyl number, 172 mg.; percentage of total alcohol, 31.563; and percentage of free alcohol, 15.903. The oil gave as color reactions with sulphuric acid, an intense red; with nitric acid, a brownish red; and with hydrochloric acid, a greenish red color.

Power alcohol: Proposals for its production and utilization in Australia (*Aust. Advisory Council Sci. and Indus. Bul.* 6 (1918), pp. 69, figs. 2).—This publication includes a general discussion of the question of liquid fuels in Australia, the advantages of alcohol as a fuel, the available sources for its production with the relative cost of the product from each source, the engine problem with proposed alterations necessary to existing types of internal-combustion engines, the utilization of by-products in distillation of alcohol, and Government regulation for the manufacture and denaturation of industrial alcohol.

The crops suggested as promising for cultivation as raw material for the manufacture of power alcohol are green sorghum stalks, sorghum grain, cassava, and sweet potatoes. As these crops are not grown at all or only on a small scale in Australia at the present time, their development may lead to the cultivation of areas unsuited for other crops, and so may assist in diversification.

It is recommended that power alcohol be denatured with 2 per cent of either the fractions of coal-tar oil distillates obtained at a temperature of from 170 to 200° C. or with creosote oil.

**Actual state of our knowledge of microbiological retting.**—Applications in the study of retting of colonial textiles, F. HEIM and RULLIER (*Bul. Off. Colon. [France]*, 10 (1917), No. 118-120, pp. 621-639).—This is a review of the literature on the subject of the mechanism of the retting of flax and hemp and the organisms which are involved in the process, with a view to the establishment of a series of experiments in regard to the retting of colonial textile fibers. The authors suggest that, since the retting organisms in tropical countries are probably different from those in European countries, it is logical to attempt to isolate the organisms acting naturally upon the vegetable tissues in the Tropics rather than to study the effects on these textile tissues of the microorganisms involved in the retting of European fibers.

**Chemicals in use in the rubber industry and their applications.** A. J. LITZ (*Arch. Rubbercult. Nederland. Indië*, 1 (1917), No. 5, pp. 403-412).—This is a general discussion of the various chemicals in use for coagulation, anti-oxidation, bleaching, and disinfection.

**The chemical composition of Hevea latex.** K. GORTER (*Arch. Rubbercult. Nederland. Indië*, 1 (1917), No. 5, pp. 375-377).—The following analysis of Hevea latex is reported per liter of latex: Rubber after coagulation with acetic acid, 370 gm.; and serum, 29.1 gm. The composition of the serum was ash, 3 gm.; protein, 3.4 gm.; quebrachite, 14.5 gm.; and sugar, 2.5 gm.

Investigations in regard to the influence of protein hydrolysis products on the velocity of vulcanization of rubber were conducted by treating 185 gm. of rubber with 15 gm. of sulphur and 0.37 gm. of leucin and comparing the vulcanization time with that of the same amounts of rubber and sulphur without the leucin. The time of vulcanization with leucin was 105 minutes, and for the control 115 minutes. The author suggests that possibly amyl amin, which at high temperatures under the influence of carbonic acid breaks down into leucin, is the substance which acts as a vulcanization accelerator.

**In regard to the possibility of manufacturing acetic acid on rubber estates.** P. E. KRUCHENIUS (*Arch. Rubbercult. Nederland. Indië*, 1 (1917), No. 5, pp. 413-417, fig. 1).—Investigations conducted by the Central Rubber Station, Dutch East Indies, show that it is possible to manufacture acetic acid from alcohol by fermentation which is cheaper than the present market price of acetic acid, and which is satisfactory for coagulation of rubber. The simple apparatus required for the fermentation is described.

**Home canning and curing of meats.** M. ANNA HAUSER (*N. J. Agr. Col. Ext. Bul.*, 1 (1917), No. 15, pp. 11).—This publication gives general directions for canning meat and poultry, for curing meat by drying and smoking, and for utilizing the fat, scraps, and trimmings in various ways.

**The canning and preserving of vegetables and fruits.** H. S. ELLIOT (*Bien. Rept. Dept. Agr. Fla.*, 14 (1915-16), pt. 2, pp. 148-162).—This is a compilation of information on the above subjects from numerous sources. It includes a classification of the methods of food preservation, a definition of canning terms, useful tables for the canner, general directions for preserves, jellies, and marmalades, and special directions for bottling the juice of grapefruit.

**Canning chart, directions, and recipes,** compiled by DILLA E. WIMPLE (*Ann. Rpt. So. Dak. Hort. Soc.*, 13 (1916), pp. 28, 29).—A two-page chart is given with explanations and suggestions for canning by the cold-pack method. Some recipes are included and a bibliography of bulletins on canning is appended.

**How to utilize and preserve our fruits with the present scarcity of sugar.** A. TRUILLER (*Vie Agr. et Rurale*, 7 (1917), No. 39, pp. 220-223).—The author has

described the preparation of different products from apples and pears according to old recipes without the use of sugar.

**Fruit and vegetable drying.**—Types and models of driers, F. L. OGDEN (*Iowa State Col., Agr. Ext. Dept., Emergency Leaflet 23 (1917), pp. 7, figs. 6*).—This leaflet discusses the advantages of drying and gives simple rules for drying. It also discusses various types of driers that are adapted to home use.

**A successful community drying plant,** C. W. PUGSLY (*U. S. Dept. Agr. Farmers' Bul. 816 (1917), pp. 12, figs. 9*).—A successful community drying plant located at Lincoln, Nebr., is described. The principle employed is an adaptation of the electric-fan process of drying. A stream of dry air is drawn continuously across the products being dried. A detailed description of the drier is given with diagrams and a bill of materials for its construction. A convenient method of heating is described. The publication also contains suggestions for the preparation of fruits and vegetables for the drier and for the storing and cooking of the dried articles. The importance of community driers is emphasized, and a working scheme for their operation outlined.

### METEOROLOGY.

**Climatology,** A. J. CONNOR (*Statist. Year Book Prov. Quebec, 1917, pp. 23-24, figs. 6*).—Tables are given which summarize data regarding temperature, precipitation, and sunshine at a number of stations in Quebec during 1916, as compared with preceding years. A method of combining temperature with rainfall to yield an index number for each month of the growing season is described, and the application of the method to the months of April to September, 1916, is illustrated. The limits of optimum temperature for plant growth as selected for this purpose were as follows:

*Limits of optimum temperatures for plant growth in Quebec, April to September.*

Period.	April.	May.	June.	July.	Aug.	Sept.
Day, lower limit.....	° F. 60	° F. 60	° F. 70	° F. 70	° F. 70	° F. 70
Night, lower limit.....	43	43	50	50	50	50

"For each station the number of days with a temperature equal to or exceeding the limit in the respective months was counted and tabulated and also the number of nights in which the temperature did not fall below the assigned limit. In effect this procedure measures the number of days which received a sufficient quantity of heat and gives no weight to heat in excess."

Regarding rainfall, it is stated that for the crops usually grown in Quebec "the efficiency of the moisture . . . in promoting growth increases rapidly and directly with the rainfall at first, but after the rainfall has reached the neighborhood of 4 in. for the month it is evident that normally a much smaller additional quantity will suffice to maintain the soil in a condition sufficiently moist for agriculture. Some method of weighting the rainfall figures is, therefore, required which will give the greatest weight to increase in rainfall below some assigned limit and little or no weight to increase above the same limit. . . . The rainfall totals (for each month) may be considered as ranging upward from zero without limit, and it is therefore always possible to find an arc of which the rainfall total is the natural tangent. Thus, for example, if the rainfall be 0.3 in., we have 0.3 as the tangent of 16° .42'; or if the rainfall be 4.5 in., we have that the tangent of 77° .28' is 4.5. Further, after the corresponding arc is

hand, we can always determine its natural sine. Thus, in the examples now quoted, the sines of  $16^{\circ}.42'$  and  $77^{\circ}.28'$  are known, respectively, to be 0.287 and 0.976. The final measure of the influence of the rainfall of 0.3 in. is 0.287 and of 4.5 in. is 0.976. A reference to the diagram (fig. 1) will show how rapidly the measure increases with the rainfall at first, but that after the rainfall has reached what we assume to be near the optimum amount the measure becomes practically constant."

The figures for temperature and rainfall are combined by means of a triangle, one side of which has units of length equal in number to the number of sufficiently warm days and the other units of length corresponding to the number of sufficiently warm nights. "If the angle between these two sides be the angle whose tangent is the rainfall, then the area of the triangle is equal to the product of those two sides into half the sine of the included angle. Or more briefly,

$$\text{Index-area} = Fd \times Fn \times \frac{1}{2} \text{ sine arc tan } R$$

where  $Fd$  is the frequency of warm days, and  $Fn$  the frequency of sufficiently warm nights, and  $R$  is the total rainfall for the month. Now, since the frequencies and the rainfall are variable for the months and for the stations, we shall obtain a series of areas which may be entered on a map and differentiated by lines in the usual manner." Charts illustrating the application of the method are given.

Where wheat is grown (U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 7 (1918), pp. 2, 3, figs. 3).—Two charts illustrating the distribution of

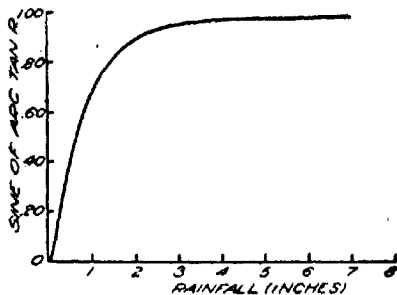


FIG. 1.—Efficiency of varying amounts of rainfall.

winter wheat growing in the United States and one chart showing the world wheat acreage are given and discussed. It is stated that "the ideal climate for wheat is one with a long and rather wet winter, prolonged into a cool and rather wet spring, which gradually fades into a warmer summer, the weather growing gradually drier as it grows warmer, with only comparatively light rains after the blossoming of the crop, just enough to bring the grain to maturity, with abundant sunshine and rather dry air toward the harvest, but without dry and scorching winds until the grain is fully ripe; and then hot, dry, rainless weather until the harvest is gathered."

Spring frosts (U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 4 (1918), pp. 2, 3, 7, 8, figs. 3).—Three charts are given and explained showing (1) dates of planting in seven zones into which the eastern part of the United States has been divided, (2) dates in spring when killing frost occurs on the average only 1 year in 10, and (3) average dates of last killing frost in spring.

Storm rainfall of eastern United States, A. E. MORGAN and C. H. PAUL (Miami [Ohio] Conserv. Dist., Tech. Rpts., pt. 5 (1917), pp. 310, pls. 3, figs. III).—This report gives in detail the results of an extended study of storm rainfall and run off in the United States east of the 103d meridian.

This study was undertaken in connection with an engineering examination of the Miami Valley, begun immediately after the subsidence of the great flood of March, 1913, for the purpose of determining the best plan for preventing damage by future floods. Every record of storms of consequence within the

area named was utilized in compiling the data reported. In compiling and analyzing the data particular attention was given to duration, intensity, and distribution of precipitation, the factors which are of most interest to engineers in general and of vital importance in investigations pertaining to flood control. A detailed analysis is given of the time-area-depth relations of 23 important storms, the aggregate extent of which reached to nearly every part of the eastern United States. For the benefit of those not especially versed in meteorological matters there is given a brief summary of the well-established meteorological facts which are most necessary for understanding and interpreting the results of the investigation. Snowfall was not considered in the investigation because it has been found to be a negligible quantity in relation to floods in the Miami Valley.

The primary object of the investigation was to reach safe and logical conclusions as to the probable size and frequency of floods in the Miami River, with a view to the working out of plans for protecting the valley against floods. The general conclusion reached was that an adequate flood-protection plan should "provide against a hypothetical storm which would cause a maximum flood run-off almost 40 per cent in excess of that of the storm of March 23-27, 1913, the latter having caused the greatest rate of run-off during the 100 years of record for the Miami River."

The desiccation of the earth, C. F. VON HERMANN (*Science*, n. ser. 47 (1918), No. 1217, p. 417).—This is a brief note referring to the formation of hydrogen by electrical discharges in the atmosphere as a cause of desiccation of the earth.

### SOILS—FERTILIZERS.

Soil survey of Meriwether County, Ga., M. BALDWIN and J. A. KERR (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils*, 1916, pp. 31, pls. 2, fig. 1, map 1).—This survey deals with the soils of an area of 318,720 acres in west-central Georgia lying wholly within the Piedmont Plateau province. The topography is generally rolling, with drainage well established.

"The soils of the county are derived from igneous and metamorphic rocks, chiefly granite, granite-gneiss, mica schist, hornblende schist, quartz schist, and quartzite. The upland soils are residual from these rocks, while the alluvial soils consist of material washed from the uplands and deposited by streams." Eighteen soil types of 8 series are mapped, in addition to meadow (Congaree material). Cecil sandy clay loam and Cecil sandy loam predominate, occupying 32.2 and 19.7 per cent of the total area, respectively.

Soil survey of Richmond County, Ga., T. M. BUSHNELL and J. M. SEXTON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils*, 1916, pp. 38, fig. 1, map 1).—This survey deals with the soils of an area of 202,240 acres situated in northeastern Georgia. The greater part of the county lies within the Coastal Plain province, the surface being reduced by stream erosion to a series of valleys and broad, level ridges with gentle to steep slopes. The extreme northern portion of the county, comprising rolling, somewhat broken land, lies in the Piedmont Plateau province, while alluvial flood plains and terraces are extensively developed along the Savannah River, which borders the county on the east.

Twenty-seven soil types, including two phases, of 16 series have been mapped in addition to meadow, swamp, and rough broken land. Norfolk sand, including the sand-hill phase, is the chief type, occupying 33.8 per cent of the total area of the county.

Kane County soils, C. G. HOPKINS, J. G. MOSIER, E. VAN ALSTINE, and F. W. GARRETT (*Illinois Sta. Soil Rpt. 17* (1917), pp. 60, pls. 2, figs. 8).—Kane County

is situated in the northeastern part of the State, lying in three glaciations and comprising an area of 513 sq. miles. A small portion of the northwest corner of the county is in the Iowan glaciation, but the material deposited by that glaciation has been almost entirely covered by a late Wisconsin gravel outwash. The west and northeast parts of the county lie in the late Wisconsin glaciation, while the western and southern parts of the county are in the early Wisconsin glaciation. The Illinoian glaciation preceded all the glaciations named, covering the area with a layer of drift 20 to 60 ft. deep. The topography of the county is undulating to slightly rolling in the intermoraine tracts, while the moraine areas are composed of a series of irregular ridges containing many little holes now mostly filled with partially decayed vegetation. Natural drainage is said to be frequently imperfect, and, although no large lakes exist in the county, many swamps occur that need artificial drainage.

The soils of the county include (1) upland prairie soils, (2) upland timber soils, (3) terrace soils, and (4) late swamp and bottom land soils, covering, respectively, 46.37, 29.43, 4.73, and 18.8 per cent of the area. Chemical analyses of the various soil types are reported.

The fertility needs and methods of management of the soils are fully discussed.

Soil survey of Kimball County, Nebr., A. H. MEYER, J. O. VEATCH, R. W. FULMER, F. A. HAYES, H. C. MORTLOCK, and C. E. COLLETT (U. S. Dept. Agr., *Recharts Field Oper. Bur. Soils*, 1916, pp. 28, fig. 1, map 1).—This survey, made in cooperation with the Nebraska Soil Survey, deals with the soils of an area of 513,120 acres in the extreme western part of the State and lying within the Great Plains province. The county is a high, nearly level to moderately rolling, practically treeless plain with an elevation of from 4,800 to 5,300 ft. above sea level. Drainage is generally good.

"The soils of the county are prevailing light brown in color at the surface with grayish, highly calcareous subsoils having a loose, friable structure. Over the greater part of the county the soils are residual in origin, the material being derived entirely from a single geologic formation. The soils derived from glacial deposits constitute about 10 per cent of the area of the county." Twelve soil types of 5 series are mapped, in addition to rough broken land. Sidney loam, Sidney gravelly sandy loam, and Sidney silt loam predominate, occupying 40.3, 28.9, and 12.8 per cent of the total area, respectively.

The experimental determination of a dynamic soil moisture minimum, R. E. PULLING (*Johns Hopkins Univ. Circ.*, n. ser., No. 3 (1917), pp. 186-188).—It is stated that a method has been devised by the use of which soil samples may be obtained with so small a water content that during 24 hours only about 0.001 gm. is moved through a space having a cross section of 30 sq. mm. The graphs obtained by plotting the data are discussed with their bearings.

Moisture equilibrium in pots of soil equipped with auto-irrigators, F. S. HOLMES (*Johns Hopkins Univ. Circ.*, n. ser., No. 3 (1917), pp. 208-210).—The author has employed the auto-irrigator devised by Livingston, studying the details of adjustment required by this device for different soils and different moisture contents. Three soils were used, medium fine white sand, light clay loam, and a mixture of volumetrically equal parts of the two, each being tested, with auto-irrigators having 1, 3, and 5 porous cups, respectively.

Approximate equilibrium of the soil moisture content was reached in 75 days for the loam, 80 for the mixture, and 90 for the sand. The number of porous clay cups appeared to influence the period required to attain equilibrium in case of the sand but not in case of the loam or the loam-sand mixture. The larger the number of cups, the sooner equilibrium was reached. With a pressure of 5.5 cm. of a column of mercury, the soil moisture content at equilibrium

was too low for plant cultures in the sand and perhaps also in the loam-sand mixture, but in the loam it appeared to be capable of supplying the plants with sufficient water for growth under ordinary greenhouse conditions.

Relation of carbon dioxide to soil reaction as measured by the hydrogen electrode, D. R. HOAGLAND and L. T. SHARP (*U. S. Dept. Agr., Jour. Agr. Research*, 12 (1918), No. 3, pp. 139-148).—In continuation of work at the California Station, previously noted (*E. S. R.*, 36, p. 117), the authors studied more fully the question of the effect of carbon dioxide on soil reaction as determined by the hydrogen electrode.

The apparatus used was the same as that employed in the previous work. "To provide a chamber for mixing the hydrogen and carbon dioxide a graduated 1,000-cc. cylinder, the base of which had been cut off, was immersed in a larger cylinder filled with mercury. The upper end of the inner cylinder was tightly stoppered and contained two capillary stopcocks for admission and outlet of the gases. A definite quantity of purified hydrogen, electrolytically generated was admitted to this cylinder through one stopcock. Through the other stopcock there was admitted from a gas burette a known quantity of pure carbon dioxide. Both gases were measured at atmospheric pressure. A sufficient time was then allowed for the thorough diffusion of the gases, which was aided by raising and lowering the inner cylinder. The reservoir of mixed gases was then connected to the hydrogen-electrode chamber which contained the soil suspension. Forty to 70 cc. of the gas mixture were forced into the space above the soil suspension, adjusted to atmospheric pressure, and the hydrogen-electrode cell was then closed. Equilibrium was hastened by the shaking method, and the voltmeter readings were noted. This procedure was repeated with new portions of the gas mixture until the voltmeter readings were constant to within 0.005 volt."

The H-ion concentrations of soil suspensions were measured under various partial pressures of carbon dioxide. It was found that "the H-ion concentration of suspensions of acid soils was not markedly affected by increasing the content of carbon dioxide up to 10 per cent. The H-ion concentration of slightly alkaline soils was slightly increased by such treatments. A notable increase in H-ion concentration was observed when soils containing alkali carbonates were similarly treated." None of the carbon dioxide treatments produced an alkaline reaction in suspensions of an acid soil, and when the original conditions were restored there was no permanent change in soil reaction which could be attributed to the carbon dioxide. The point of view that solutions in equilibrium with acid soils contain H ion in excess of OH ion was confirmed.

A short bibliography of the subject is given.

[Partial sterilization of soil], E. J. RUSSELL (*Country Life* [London], 42 (1917), Nos. 1092, p. 548; 1093, pp. 578, 579, figs. 6).—The history and general principles of soil sterilization as a means of increasing productivity are briefly discussed, and methods in practical use in England, particularly by tomato growers, are described. In one of the methods most successfully used steam is blown from a boiler under a large tray 6 by 8 ft. placed on the soil, and it rapidly penetrates and heats the soil to a depth of 8 or 9 in.

The search for a suitable antiseptic soil sterilizer which will also be an effective insecticide is referred to. This is considered a great national need in England, since so much grassland has to be plowed up, and "wireworms, leather-jackets, and other pests appear in the young crops on the freshly broken land and do considerable damage."

Humification of compounds entering into the composition of vegetable matter, A. G. TRUSOV (*Selsk. Khoz. i Lesov.*, 252 (1918), Nov.-Dec., pp. 26-47).—This is a continuation of work previously noted (*E. S. R.*, 33, p. 26).

Experiments on the formation of so-called humin acid in mixtures of leaves with various organic substances showed that lignin, tannic acid, and albuminous substances, and some vegetable oils are sources of humin acid, while cellulose, starch, glucose, gum, and cork are not. The amount of humin acid was greatly decreased by the elimination of substances soluble in water and alcohol from decomposed vegetable remnants. More humin acid was washed into the soil from steppe grass than from the same amount of forest litter.

Papilionaceous plants gave only humin acid soluble in water.

The decomposition of sweet clover (*Melilotus alba*) as a green manure under greenhouse conditions, L. A. MAYNARD (*New York Cornell Sta. Bul.* 24, (1917), pp. 121-149, figs. 3).—This reports the results of investigations conducted during 1914 and 1916 relating to the use of sweet clover as a green-manure crop, with special reference to the ability of the plant to gather nitrogen and the rate of decay of the plant when incorporated with the soil. Volusia silt loam soil was employed in the experiments, the plants being grown in pots in the greenhouse. The soil was inoculated with a pure culture of the sweet clover organism. In one series of pots the lime requirement was satisfied by the use of slaked lime, in a second series by finely ground limestone, while a third series was left unlimed. Seed tested for germination showed a germination percentage after four days of from 28 to 32 for untreated seed, and of from 85 to 98 for seed treated by the sulphuric-acid method described by Love and Leighty (*E. S. R.*, 27, p. 524).

The investigations during 1914 comprised a study of the yield and composition of the sweet-clover plant after a period of growth of 62, 89, and 118 days, respectively, for both the limed and unlimed pots. Data are also presented on the formation of nitrates in pots having the plants removed or turned under after a growth of 89 and of 118 days for a four-month period.

The 1914 results having indicated that the four-month period of growth gave the best results from the standpoint of the amount of available green manure produced, it was decided to grow the plants for that period in 1916 before turning them under. Data similar to that noted above are, therefore, presented for plants grown 118 days.

In discussing the results obtained statistical methods are employed so far as possible with regard to the production of dry matter and nitrogen, percentage of fiber, and rate of decay.

Recognizing the desirability of repeating the experiments under field conditions before drawing general conclusions, the author summarizes his studies as follows: "These experiments show that sweet clover will make a satisfactory growth for use as a green manure in three or four months on a worn-out soil, provided the lime requirement is satisfied. When the crop is harvested at either of these periods it compares favorably in nitrogen content with other legumes, and sufficient fiber has not developed to inhibit rapid decay. Growing the crop for the longer period does not result in an increased proportion of fiber.

"The plant responds readily to inoculation with the appropriate organism. To secure a good stand the seed bed should be compact and treated seed should be used. The use of treated seed is important also from the standpoint of economy. Treating the seed with acid increases the percentage of germination threefold, and seed so treated does not lose its increased germinating power for at least ten months. Satisfying the lime requirement of the soil was found to increase the yield 50 per cent for the crop grown four months. . . .

"Sweet clover grown for three or four months decays rapidly when used as green manure. It was found that in the limed pots sufficient nitrates had been



produced four months after harvest to account for approximately 50 per cent of the nitrogen added in the material turned under. From the standpoint of the amount of available plant food, it is desirable that sweet clover, to be used as a green manure, should be grown for at least four months.

"The measurement of nitrate formation in pot experiments is subject to a large probable error. This fact is a real objection to the method as a quantitative measure of rate of decay."

A bibliography of 22 titles is appended.

Composition of fallen leaves of forest trees and their quantities, S. Mouri. (Extracts from *Bul. Forest Expt. Sta., Tokyo, 1915, pp. 23-33; obs. in Chem. Abs., 11 (1917), No. 10, p. 1513*).—To ascertain the manurial value of fallen leaves of forest trees the fallen leaves of sugi (*Cryptomeria japonica*), akamatsu (*Pinus densiflora*), kuromatsu (*Pinus thunbergii*), kunugi (*Quercus serrata*), konara (*Quercus glandulifera*), and shirakashi (*Quercus vibrayana*) were collected and analyzed.

"The most important ingredient of fallen leaves is no doubt nitrogen. Among conifers, the sugi leaves are richest in nitrogen, containing 0.972 per cent, or about 1 per cent of the air-dried substance. Sugi is followed by akamatsu, showing a percentage of 0.885, and kuromatsu, of 0.853. Broad leaves are generally richer in nitrogen than needle leaves, those of kunugi containing 1.116 per cent, shirakashi 1, and konara 0.945.

"Broad-leaved trees have a larger proportion of ash in their leaves than conifers. Among conifers, sugi, however, is relatively rich in ash, containing 6.1 per cent of the air-dried substance, which is three times that of the ash content of akamatsu or kuromatsu. Among broad-leaved trees, kunugi has an ash content of 3.55 per cent, while konara contains nearly twice as much as the preceding, and shirakashi has a still larger quantity, the content being 9.12 per cent.

"Taking the three important ash ingredients known as phosphoric acid, potash, and lime among the fallen leaves of the six aforesaid trees, sugi leaves are richest in phosphoric acid and lime. Its richness in lime is particularly noteworthy, as it contains 2.999 per cent of the air-dried substance, or 49.164 per cent of the total ash. Phosphoric acid, too, is found in considerable amount in sugi leaves. Akamatsu and kuromatsu leaves . . . are rich in phosphoric acid, being not inferior to those of broad-leaved trees, although they are poor in potash content. The content of silica in kuromatsu is richer than that in akamatsu, and to this is due the difference in the total ash content of the two pines, though there is no particular difference in other ingredients of the ash. Further, among broad-leaved trees, shirakashi and konara are rich in ash content owing to the large amount of silica, while phosphoric acid and lime are found almost in the same quantity as in other oaks such as kunugi. Shirakashi is further characterized by the rich content of potash."

With the object of determining the difference in the composition of fresh fallen leaves and well-rotted ones, samples were taken from beds of well-rotted leaves in the spots where fallen leaves were collected. It was found that "well-rotted leaves are richer in nitrogen than fresh fallen leaves. Since well-rotted leaves of akamatsu and kunugi contain 1.5 per cent of nitrogen in round numbers, they both have a certain manurial value owing to their nitrogenous content. . . . Compared with freshly collected leaves, the silica, magnesia, and oxid of iron contained in the ash of well-rotted leaves are remarkably large in quantity. Phosphoric acid, potash, and lime are, however, gradually washed away and decrease with the lapse of years."

Studies of the soils of sugi, akamatsu, and kunugi woods showed them to differ considerably in composition. "This is chiefly due to the difference of tree

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species, the age and [spacing] of the standing trees, as well as the other forest conditions. One point common to the three lots is the richness in nitrogen, phosphoric acid, potash, and lime."

The utilization of sewage water in Italy, A. AITA (*Italia Agr.*, 33 (1915), No. 11, pp. 499-508; also in *Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 1, pp. 30-32).—Analyses of the sewage waters of several Italian cities and of night soil from Cremona are reported and discussed.

The author is of the opinion that with normal coal prices the manufacture of ammonium sulphate in Italy from the supernatant liquid from settled night soil would be worth while, especially in the smaller towns. Large-scale experiments by him showed the impracticability of the method of extracting ammonia by the prolonged effect of a current of air passing through the liquid. A brief description is also given of the treatment of the solid residues as carried out in England and Germany to extract the fatty matter.

Commercial fertilizers in war time, C. E. THORNE (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 1, pp. 3-7, figs. 2).—Reviewing the results of experiments extending over several years at four different places in Ohio, the general conclusion is reached that "acid phosphate may be used with certainty of a profitable increase of crop under existing market conditions, but that the additional increase produced by adding nitrogen or potassium to the phosphate is likely to be worth less than the added cost of the fertilizer." The results also emphasize the importance under present conditions of the systematic production and careful saving and use of animal manures.

The influence of sodium nitrate upon nitrogen transformations in soils with special reference to its availability and that of other nitrogenous manures, D. A. COLEMAN (*Soil Sci.*, 4 (1917), No. 5, pp. 345-452, fig. 1).—This is a report of a detailed study of the influence of sodium nitrate on ammonification of dried blood and cottonseed meal in acid and alkaline soils and in the presence of acid phosphate or potassium chlorid, or both; on nitrification of ammonium sulphate, dried blood, and cottonseed meal; and on nitrogen fixation; as well as observations upon nitrate transformation by soil micro-organisms. Seven typical sandy, loam, and muck soils from different parts of the country, as well as "niter spot" soils from Colorado, were used in these studies. The data are tabulated and discussed in considerable detail and the more pertinent results of the investigations summarized.

Applications of sodium nitrate markedly increased the simplification of protein material applied to soils, the results varying somewhat with the source of the organic matter. For example, cottonseed meal was ammonified to a larger extent in the presence of sodium nitrate than was dried blood.

Acid phosphate increased the ammonification of dried blood nitrogen, but sodium nitrate added as a limiting factor did not stimulate the decay of the material. Potassium chlorid had a slight stimulating effect in some soils while in others no action was observed. Sodium nitrate decreased ammonia accumulation in soils supplied with dextrose. Combined in the proper proportions, sodium nitrate, acid phosphate, and potassium chlorid increased the simplification of organic matter to a greater extent than any one of these substances alone.

Sodium nitrate lost its stimulating power to a great extent in alkaline soils and, it is explained, to an increased number of bacteria which assimilated a considerable proportion of the simplified material, and also to a rearrangement of the soil flora. Of the soil flora studied the soil fungi responded most to applications of sodium nitrate with the bacteria next.

The stimulating influence of sodium nitrate was found to be due to the anion.

Sodium nitrate stimulated the nitrification of dried blood, cottonseed meal, and to a less extent ammonium sulphate. This stimulative action was not apparent, secondary reactions, such as increased cell division, with a subsequent assimilation of nitrates, masking the end point. Large quantities of sodium nitrate depressed nitrification, the amount of the depression depending first upon the sources of nitrifiable material and second upon the soil type. In large quantities sodium nitrate became toxic first to the nitrification of ammonium sulphate, then to dried blood, and lastly to cottonseed meal.

Sodium nitrate in amounts up to 5,000 lbs. per acre affected *Nitrobacter* the same as *Nitrococcus*, while in amounts beyond 5,000 lbs. it stopped the activities of *Nitrobacter* but not those of *Nitrococcus*. Sodium nitrate in small quantities stimulated nitrogen fixation by *Azotobacter* and in large quantities depressed it.

Large quantities of nitrates were assimilated by organisms in the soil, the amount so assimilated being approximately 20 per cent of the nitrogen applied. Apparently calcium nitrate was as readily assimilated as sodium nitrate. Experiments on the nitrifiability of microbial matter gave widely varying results.

Of the three nitrogen-transforming groups, sodium nitrate affected the nitrogen-fixing group most adversely, the nitrifying group to a lesser degree, and the ammonifying group least. As used in agricultural practice, sodium nitrate generally stimulates the activity of the ammonifying and nitrifying groups, but depresses the activity of the nitrogen-fixing group. In no case is it thought to cause toxicity if applied rationally.

It is concluded that "the entire study of the influence of the sodium nitrate upon nitrogen transformations in soils seems to indicate rather strongly that in the cases where larger quantities of nitrogen are recovered in the crop than can be accounted for by the amount of sodium nitrate applied this is due to a drawing on the soil's own nitrogen supply. This supply is acted upon by a stimulated bacterial flora, brought about by the presence of sodium nitrate. On the other hand, where more or less of the nitrogen applied is recovered the variations in the recovery may in a large measure be explained on the grounds of assimilation of nitrates by soil organisms."

The literature of the subject is reviewed at some length and a bibliography of 226 titles is given.

Influence of nitrates on nitrogen-assimilating bacteria, T. L. HILL (U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 4, pp. 183-230).—This is a report of investigations contributed from the Wisconsin Experiment Station, on the influence of ammonium, potassium, sodium, and calcium nitrates in amounts varying from 10 to 300 mg. per 100 gm. of dry soil on the growth and physiological activities of *Azotobacter* and *Bacillus radiclecola* in sterilized silt loam soil containing 2.75 per cent of organic matter and 1.5 mg. of nitrate per 100 gm. of dry soil. The following is a summary of the results:

"Small quantities of potassium, sodium, and calcium nitrates caused a great increase in the number of *Azotobacter* in sterilized soil. Ammonium nitrate in the same quantities caused a less marked increase. Higher concentrations were not so favorable to the growth of the organisms.

"Potassium and sodium nitrates in the concentrations studied caused an increase in the amount of nitrogen assimilated by *Azotobacter* on agar films. Calcium nitrate in the same amounts brought about a decrease in the amount of nitrogen fixed to a point even below that representing the amount assimilated in the absence of nitrates. In soil cultures nitrates of sodium and calcium caused an increase in total nitrogen, which was more marked in the unsterilized cultures than in those cultures sterilized and inoculated with a pure culture of *Azotobacter*. However, the increase in total nitrogen is not commensurate with the increase in the number of *Azotobacter* noted under the same conditions.

Under aerobic conditions *Azotobacter* in liquid cultures reduced nitrate to nitrite, but not to ammonia. More atmospheric nitrogen was assimilated in the presence of nitrate than in the absence of this salt.

Pigmentation occurred when potassium and sodium nitrates, and especially sodium nitrate, were used with *Azotobacter*, the coloration increasing with the concentration of the salt. This effect was more marked in *Azotobacter* strains which produce little or no pigment in the absence of nitrates.

All three nitrates studied caused an increase in the number and size of nitrite bodies in *Azotobacter* cells. From all appearances these salts also tended to hasten the development of these bodies.

The number of *B. radicicola* in sterilized soil was increased by the addition of small quantities of potassium, sodium, ammonium, and calcium nitrates. This increase was not so marked as in the *Azotobacter* cultures. *B. radicicola* appeared to be much more resistant to higher concentrations of nitrates than *Azotobacter*.

*B. radicicola* under aerobic conditions did not reduce nitrates in solution to nitrite, ammonia, or elemental nitrogen. The presence of nitrates did not materially influence the small amount of atmospheric nitrogen fixed under these conditions. When grown on agar films, *B. radicicola* fixed a small amount of nitrogen, varying from 0.15 to 0.43 mg. of nitrogen in 100 cc. of the medium. The addition of various amounts of potassium, sodium, and calcium nitrates increased to a slight extent the amount of nitrogen assimilated. In liquid cultures all three nitrates caused a large increase in the amount of gum obtained by precipitation with acetone.

The presence of large amounts of potassium, sodium, and calcium nitrates proved detrimental to the formation of nodules on alfalfa. *B. radicicola* did not appear to lose its infecting power when grown on media containing varying amounts of sodium and calcium nitrates. Alfalfa seedlings grown in the presence of large amounts of nitrate did not produce nodules when inoculated with a viable culture of *B. radicicola*. Nitrates in soil cultures prevented the reformation of nodules once removed and also caused a decrease in the number of nodules already present.

A list of 49 references to literature cited is given.

The addition of tar to calcium cyanamid to facilitate spreading, SCHWONOW and LUCKA (*Mitt. Deut. Landw. Gesell.*, No. 10 (1917), pp. 156, 157; *abst. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 4, pp. 842-844).—"In experiments carried out at the agricultural station at Danzig (Prussia) to find, if possible, a method to facilitate the spreading of calcium cyanamid, good results were obtained by mixing the manure with 15 per cent of coal tar.

The cyanamid is first mixed with the tar and then passed through a mixing machine. The material thus obtained is rather similar to superphosphate. It may be easily spread without powdering, a characteristic which it does not lose even when kept for a long time. The addition of tar causes no loss of nitrogen.

In order to determine whether the addition of tar is harmful to plants fertilized with cyanamid, pot-manuring experiments were carried out with oats during the summer of 1915. The plants grew equally well in pots treated with cyanamid and tar as in those treated with pure cyanamid or with ammonium sulphate, and much better than in pots without nitrogenous manure. . . .

In April, 1916, a second experiment was begun. This was carried out with ten pots divided into five equal groups treated respectively with the following manures: (1) No manure, (2) pure calcium cyanamid, (3) cyanamid plus

10 per cent of tar, (4) cyanamid plus 25 per cent of tar, and (5) ammonium sulphate. In each pot were sown 20 oat seeds, in five immediately after harrowing, and in the other five a fortnight later. The pots were kept in the garden throughout the whole experiment. Sprouting was normal in all the pots, but shortly after, the plants which had not been manured showed less vigor. . . . The plants matured well and gave the following average yields: (1) Grain 7.1, straw 13; (2) grain 12.5, straw 24.2; (3) grain 12.4, straw 23.2; (4) grain 12.5, straw 21.6; and (5) grain 12.2, straw 24.3. Nitrogenous manure thus increased the yield by about 70 per cent without there being any visible difference between the various kinds. It may, therefore, be concluded that cyanamid had no harmful effect on the plants."

In 1915-16 the experiment was repeated with wheat in the open. Six plots of 614 sq. yds. each were used, three of these being treated with 35 lbs. of cyanamid and tar and the other three not manured. The manure was harrowed in and the seed sown immediately after. "The plots, especially those which had been manured, all looked exceedingly well throughout the experiment. Two cwt. of tarred cyanamid (16.7 per cent nitrogen) increased the grain yield by 1.04 cwt. and the straw yield by 4.07 cwt."

A new German phosphatic and potassic manure, C. BECKER (*Fühling's Landw. Ztg.*, 66 (1917), No. 2, pp. 55-58; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 5, pp. 697, 698).—Analyses of a new phosphatic potassic manure made in Germany showed it to contain 8.7 per cent total, no water-soluble, and 6.1 per cent citrate-soluble phosphoric acid; and 6.3 per cent total and 5.6 per cent water-soluble potassium.

"The author tested this manure on mustard in pots, taking into consideration only the phosphoric acid and comparing it in three different amounts (0.2 gm., 0.4 gm., and 1 gm. of  $P_2O_5$ ) with manure containing all the chief food materials except phosphoric acid, basic slag, and 'Rhenaniaphosphat.' Basic slag gave the best results; next came 'Germaniaphosphat' and 'Rhenaniaphosphat,' which gave yields only equal to 38 to 74 per cent and 48 to 83 per cent, respectively, of the yield obtained by the use of slag. 'Germaniaphosphat' is, therefore, slightly superior to 'Rhenaniaphosphat.' The author considers 'Germaniaphosphat' worthy of use in agriculture, but realizes that his manuring experiments only have a limited value and should be repeated."

The substitution for Stassfurt potash salts of finely crushed Austrian phonolites, J. STOKLASA (*Österr. Ungar. Ztschr. Zuckerind. u. Landw.*, 45 (1916), No. 5-6, pp. 421-456; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 5, pp. 698-700; *Chem. Abs.*, 12 (1918), No. 7, p. 735).—Experiments are reported from which the conclusion is drawn "that potassic salts promote the growth and activity of bacteria useful to the soil. In this respect, however, phonolite is much inferior to kainit and potassium chlorid."

Bromin content of German potash salts, L. W. WINKLER (*Ztschr. Angew. Chem.*, 30 (1917), No. 27, pp. 95, 96; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 6, pp. 841, 842).—Data are reported showing that German potash salts contain a fairly high percentage of bromin.

New experiments on the action of sulphur on crop production, PRUEFER (*Fühling's Landw. Ztg.*, 65 (1916), No. 7-8, pp. 193-207; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 1, pp. 33-34).—Plat experiments with barley on a soil rich in organic nitrogen compounds are reported to determine the influence of sulphur when added with barnyard manure and with dried blood. The manure was used at the rate of 8 tons per acre and the sulphur at the rate of 357 lbs. per acre.

It was found that with sulphur plus barnyard manure there was a decreased yield of grain and straw as well as a decreased nitrogen content of the crop. Sulphur plus dried blood acted satisfactorily, but the excess of yield was not very great. It is concluded that the application of sulphur either with barnyard manure or dried blood produced no particular effect in the crop. The author is also of the opinion in this connection that the calculation of the probable variation is an excellent method for forming an objective opinion on the results of experiments.

Former experiments by the author on the action of sulphur have been previously noted (E. S. R., 34, p. 331).

The use of iron in agriculture, A. MONNIE and L. KUCZYNSKI (*Arch. Sci. Phys. et Nat. [Geneva]*, 43 (1917), No. 1, pp. 66-68; *abst. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 5, pp. 693-695.)—Experiments are reported to determine (1) the degree of solubility of the iron already in the soil, and (2) the changes undergone by ferrous and ferric compounds in arable land.

Soils of normal composition showed no trace of iron when washed with pure water or dilute solutions of alkaline carbonates and bicarbonates. A soil containing 3.2 per cent of iron and 6 per cent of lime showed traces of iron when treated with 5 per cent acetic acid. The solution by 1 per cent citric acid and tartaric acid gave distinct iron reactions, and that by 1 per cent oxalic acid gave a strong iron reaction. "One hundred gm. of soil gave 1.02 gm. of iron when treated with the citric solution, and 0.06 gm. of iron when treated with the oxalic solution.

"Certain silicious soils entirely lacking in lime, as, for example, the soil of Angers, give a fairly large proportion of iron soluble in pure water. In these soils pink hydrangeas give blue flowers; but, if a small quantity of calcium carbonate or magnesia is mixed with the soil it no longer gives up any iron and the hydrangeas do not become blue. The compounds of soluble iron are, therefore, precipitated by the lime.

"A 1/1,000 solution of ferric chlorid was filtered through a layer of soil 20 cm. thick. All the iron was retained in the upper part which turned red-brown. Calcium carbonate precipitates the iron in the form of a basic carbonate which gradually becomes a hydrate. The line of separation is clearly marked, and the filtered liquid contains no iron, but a large proportion of chlorine and calcium. This experiment was repeated with many samples of soil containing different quantities of lime. The colored layer increases in thickness in proportion as the lime content of the soil decreases. The thickness of the colored layer does not exceed 2 cm. in soil containing 5 per cent of calcium carbonate. If ferrous sulphate is used instead of ferric chlorid, the salt is oxidized and precipitated, and a mixture of basic sulphate and hydrate is formed, which colors the superficial layer red-brown, as in the case of ferric chlorid.

"The results of these experiments show that the iron contained in soils of normal composition is present in a form very difficult to assimilate, which explains the increased yield when very small amounts of soluble iron are added. The manure can have no favorable effect unless it is placed directly within reach of the roots. This condition is found in pot cultures or when the manure is added at the beginning of growth, but it is no longer present when the roots have entered the soil to a certain depth where they receive no trace of the ferric manure, which has been held up and made insoluble in the surface layers of the soil.

"Tests were also made with potassium ferrocyanid as a source of iron. The results showed that the compound is not rendered insoluble in the soil,

but that the salt undergoes a double decomposition, part of the potassium being retained by the soil. When the solution filters through the soil it turns greenish. This is due to the transformation of the ferrocyanid into ferricyanid. This oxidation appears to be due to some surface action, as it also occurs when the solution is filtered through fine sand. Experiments with potassium ferrocyanid did not give good results as, even in dilute solutions, the salt has a harmful action on vegetation."

Manurial experiments with manganese slag, M. PÖR (Fühling's *Landw. Ztg.*, 85 (1916), No. 15-16, pp. 354-360; *abstr. in Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), No. 11, pp. 1600, 1601; *abstr. in Jour. Soc. Chem. Indus.*, 36 (1917), No. 16, p. 933).—It is stated that "the manufacture of ferromanganese and spiegeleisen in Germany yields as by-product large quantities of manganese slag, of which the average composition is 24.1 per cent Mn., 30.5 per cent  $\text{SiO}_2$ , 9.8 per cent  $\text{Al}_2\text{O}_3$ , 33.4 per cent CaO, 6.3 per cent MgO, 1.2 per cent sulphur, and traces of iron. The manganese is insoluble in water but slowly soluble in weak acids.

"A series of pot experiments were carried out to compare its manurial value with that of anhydrous manganese sulphate. White Petkus oats were sown in pots each containing 10 kg. of sandy soil (with 0.28 per cent CaO, 0.14 per cent  $\text{P}_2\text{O}_5$ , 0.13 per cent  $\text{K}_2\text{O}$ , and 0.15 per cent nitrogen), which received further 1.5 gm. of potash, 1 gm. of phosphoric acid, 1.5 gm. of nitrogen, and 60 gm. of calcium carbonate in the form of marl, besides dressings ranging from 0.5 to 10 gm. of manganese either as finely powdered slag or as sulphate. The manganese slag increased the yield of both grain and straw, and the increase was greater the larger the amount applied, except for the maximum dressing (10 gm.). In small amounts (0.5 and 1 gm.) the sulphate was more effective than the slag, but with the larger dressings (2.5 and 5 gm.) the reverse was the case. With manganese slag the yield of grain was affected more than that of straw, while the sulphate affected the yield of straw most."

### AGRICULTURAL BOTANY.

A textbook of botany for colleges, W. F. GANONG (New York: The Macmillan Co., 1917, pp. XIII + 604, figs. 402).—This edition is practically the same as the volume previously noted (E. S. R., 36, p. 429), with the addition of chapters on the genetic and ecological classification of plants.

Plant physiology, V. I. PALLADIN, edited by B. E. LIVINGSTON (Philadelphia: P. Blakiston's Son & Co., 1918, English ed., pp. XXV + 320, figs. 173).—This is an authorized English edition based on the German translation of the sixth Russian edition and on the seventh Russian edition published in 1914. The book is specially designed for students and is noteworthy for its brevity and conciseness. The subject matter is largely treated from the standpoint of physiological chemistry as applied to plant life, the chemical aspects of plant physiology receiving special emphasis. The editor, by means of copious notes, has added much pertinent material, thus completing the presentation of the subject. The part of the work devoted to the physiology of nutrition is much more extended than that treating of growth, configuration, and reproduction, but a classified list of books makes available references to additional information.

[Studies in plant nutrition], P. L. GILK and J. O. CARRERO (Porto Rico Sta. Rpt. 1916, pp. 13-17).—Summary reports are given of investigations on lime induced chlorosis, immobility of iron in the plant, the assimilation of iron by rice from certain nutrient solutions, and the absorption of nutrients as affected

is the number of roots supplied with the nutrient. More detailed accounts of these investigations have been published elsewhere (E. S. R., 36, pp. 546, 128, 31; 37, p. 222).

Biometric studies on the somatic and genetic physiology of the sugar beet, J. A. HARRIS (*Amer. Nat.*, 51 (1917), No. 608, pp. 507-512).—This is a discussion of the recent work by investigators bearing upon the conclusions previously announced by the author with Gortner (E. S. R., 30, p. 208), regarding the correlations in the sugar beet, more particularly between the weight of the root and the sugar content of the juice.

Growth and imbibition, D. T. MACDOUGAL and H. A. SPOHR (Proc. Amer. Phila. Soc., 56 (1917), No. 4, pp. 289-352, figs. 13).—The chief purpose of the studies here described was to correlate some of the more striking features of the growth in plants with the action of the factors contributory thereto, and to analyze this complex process so far as possible.

To a study of cacti, continuing that previously reported (E. S. R., 36, p. 524), was added a study chiefly of Zea and Triticum, results of which are given in detail and discussed. Experimentation with colloids, presumably comparable with protoplasm, has yielded many striking parallels with growth, making possible some new correlations in metabolism, imbibition, and growth. There has been effected, however, no simplification of the major processes of growth, the advances being rather in the opposite direction.

Newly determined features of carbohydrate metabolism have been found to be extremely complex. Imbibition in the plant is not that of a single colloid and swelling is not the simple resultant of the action of two or more substances. The interaction between two emulsoids presents many possibilities. The proteins viewed physiologically are thought to act as sensitizers to the carbohydrate salts which make up the greater part of the bulk of the protoplast, and to produce in them highly specialized effects with acids, alkalis, and neutral solutions. The general character of respiration and the nature and amount of its by-products acting upon the sensitized protoplasmic gel may be taken, it is thought, to determine the general aspect, rate, course, and amount of growth in plants.

Approximation of the limits of the germination in seeds of *Lepidium sativum*, P. LEEAGE (*Rev. Gén. Bot.*, 29 (1917), Nos. 340, pp. 97-112; 341, pp. 137-153, fig. 1; 342, pp. 181-192).—The author reports with discussion some tabulated results of experimentation which is still in progress on the germinability of seeds of *L. sativum* subjected for different periods of time to various media, such as alcohol, ether, salt solutions, moist air, oxygen, and water.

The physiological significance of tannin, J. DEKKER (*Rec. Trav. Bot. Néerl.*, 14 (1917), No. 1, pp. 60, pls. 8).—The author describes a study of the presence, location, and significance of tannin in Ribes, Rhododendron, Rosa, and Kentia. This is conceded to be inadequate as a basis for sweeping general conclusions, although these four plants agreed in showing the presence of tannin in the conducting cells of the phloem. The agreement may be accidental or of limited significance.

A noteworthy result of this investigation is the discovery of tannin-conducting channels in the pith and in the outer cortex of the younger shoots. These are described. Differences are pointed out among the plants investigated.

Large accumulations of tannin are noted in regions in which the life processes are particularly active, as in the point of a shoot in full growth, in buds, or near regions from which a stem or root arises. In such localities also a considerable amount of calcium oxalate is often found.

On the relation of chlorin to plant growth, W. E. TOTTINGHAM (*Johns Hopkins Univ. Circ.*, n. ser., No. 3 (1917), pp. 217-221).—Preliminary investigations are here discussed.



The results up to this time on the different plants named leave the question regarding the influence of the chlorin ion and chlorids upon plants in a very complicated and unsatisfactory condition, apparently not admitting of any general statement. It is thought that the effect of chlorin upon any given plant depends upon the nature of the plant and the soil and climatic conditions. Progress in the interpretation of the climatic complex as a whole may be required. More complete experimental control of the very numerous conditions that make up the environment of the plant is also essential, as it is the summed or integrated effect of all of these that is registered by plants in growth and crop production.

A study of salt proportion in a nutrient solution containing chlorid, as related to the growth of young wheat plants, S. F. TRELEASE (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 222-225*).—In the experiments of which this is a preliminary report, the chlorin ion was added as potassium chlorid to nutrient solutions already containing all the essential elements usually absorbed by plant roots, in the form of the salts calcium nitrate, magnesium sulphate, monopotassium phosphate, and ferric phosphate. The total concentration of the solutes corresponded to an osmotic pressure of about 1.6 atmospheres at 25° C., and the relative proportions of the salts were used in all possible ways by making additions of one-tenth of this total concentration, each complete set including 84 different solutions. The data obtained are discussed in connection with the findings and views of other investigators.

It was found that with combinations of the three salts monopotassium phosphate, calcium nitrate, and magnesium sulphate, or these with potassium nitrate or with potassium chlorid, the same growth is obtained if the best proportions of the salts are used in each case. This generalization is thought to have an important bearing upon the whole problem of physiological balance in nutrient solutions, and to furnish what may prove to be important suggestions bearing on our general conceptions of conditional control and conditional optimum for plant activities.

The relation of the concentration of the nutrient solution to the growth of young wheat plants in water cultures, S. F. TRELEASE (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 225-227*).—These experiments differed somewhat from those above noted. The salt proportions were the same in all different solutions of each series, but the solutions differed from each other in total concentration.

It is stated that transpiration and dry weight showed an approximately linear relation to the concentration of the medium above the optimum and that these decreased with an increase in concentration. The optimum concentration for dry weight of tops was altered from 1.6 to 4.5 atmospheres by changing the proportions of the four salts used in two of the series. The omission of potassium chlorid did not change the relation between growth and concentration.

The effect of renewal of culture solutions on the growth of young wheat plants in water cultures, S. F. TRELEASE and E. E. FREE (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 227, 228*).—Reporting detailed results of experiments on the growth of wheat plantlets in the nutrient solutions found by Shive (*E. S. R., 36, p. 325*) to be the most suitable for the production of dry weight of tops in wheat, the author states that frequent changing of the solution increased the yield. Daily change produced marked improvement and continuous flow was even more beneficial. Marked injury was observed when the solution was changed as infrequently as every two weeks. Shaking with bone black improved the solution slightly but did not correct in any great

agrees the harmful effects of infrequent changing. Magnesium injury was more marked in case of frequent changing.

Some experiences in the use of copper sulphate in the destruction of algae. G. EMMERY (*Analyst*, 42 (1917), No. 497, pp. 264-271, pl. 1).—This is a report, with discussion, of a number of experiments following up the studies of Moore and Kellerman (E. S. R., 17, p. 12) on the effects of combined copper on algae in reservoirs.

Chara was destroyed by a solution of 1 part copper sulphate to 3,000,000 parts water. This plant (as well as its parasites) appeared, however, on careful study, to be free from the odor ascribed to it. Further tests seemed to identify this odor as due to Tabellaria or Asterionella, or both, and to determine its character as that of a fatty oil colored with diatomin, a body closely allied to chlorophyll. The changes supposed to occur in the copper compound are briefly indicated. It is thought that oxid of copper is the real poisoning agent, and if, as is supposed, the fatty oil serves as a lubricant, the oxidation of the copper compound may be the real cause of the death of the plants.

The copper sulphate should probably be added not later than the end of April. This destroys the desmids and diatoms and prevents the formation of an organic mass into which the rootlike thallus of Chara can penetrate. This organism is almost eradicated from water subjected to this treatment.

Serodiagnostics studies on gymnosperms, R. KOKETSU (*Bot. Mag. [Tokyo]*, 31 (1917), No. 365, pp. 144-153).—This is an attempt to extend the method of serodiagnostics study to gymnosperms, a number of these having been employed in this investigation, the methods and results of which are detailed. It is claimed that the indicated relationships of the plants employed agree in a general way with those already expressed in modern classification.

Studies on root nodules, K. SHIBATA and M. TAHARA (*Bot. Mag. [Tokyo]*, 31 (1917), No. 366, pp. 157-182, pl. 1, figs. 16).—The authors report studies on the comparative anatomy of root nodules, classifying the plants examined so that the first type of root nodules is represented in Corfaria, the second in Myrica, the third in Gale (*Myrica gale*), and the fourth in Alnus, Elaeagnus, and Ceanothus.

Variation in Plantago, S. IKENO (*Genetics*, 2 (1917), No. 4, pp. 390-446, figs. 2).—In a study of a variegated garden race of *Plantago major asiatica* the author found this plant to breed true to type generally by self-fertilization, though this process sometimes gave a few self-colored green plants. The F<sub>1</sub> hybrids between variegated and ordinary self-colored green plants are self-colored green irrespective of the direction in which the cross is made. The self-colored green plant contains two factors, showing variegation only when both are absent. Each of these factors is able, independently of the other, to produce the exact intensity of green produced by both together. The F<sub>1</sub> plants which breed true to greenness in successive generations (constant green plants) are not always of the same genetical constitution, as has been shown by hybridization tests. Each of the few green plants produced by self-fertilization of variegated plants exhibited segregation in approximately the ratio of three green to one variegated.

Further tests are in progress regarding the genetical behavior and constitution of these plants.

Recent studies on variation in some species of micromycetes, ELISA MUTTO and G. POLLACCI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 26 (1917), I, No. 9, pp. 498-502).—The investigations previously reported (E. S. R., 35, p. 547) have been followed by studies with cultures of *Contoithyrium tirolense* and *Phyllosticta pirina* on different media, the results of which are tabulated and contrasted.

Some unusual features of a subarctic soil, H. E. PULLING (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 188-190*).—A preliminary survey of the ecological features of subarctic forests in northern Manitoba has yielded information that emphasizes the need of including the physical root environment in an ecological study of these regions.

The soil of the spruce forest, the characteristic type of this region, is covered chiefly with sphagnum, which holds large quantities of water, except in hillside forests, in which case the soil underneath the moss, due to conditions which are explained, is usually dry and may blow as dust. Roots penetrate this dry layer only to a slight extent, although organic deposits occur as far down as the frost line. No explanation is given of the mode of origination of these deposits, nor of the fact that the soil in the dry layer is often flocculated to such a degree that it resembles a mass of small clay pellets, retaining its spherulate character even after it has been soaked with water.

The western flower guide, C. F. SAUNDERS (*Garden City, N. Y.: Doubleday, Page & Co., 1917, pp. 286, figs. 250*).—Brief nontechnical descriptions, accompanied by colored drawings, are given for the ready identification of 250 of the more common wild flowers found from the Rockies to the Pacific coast.

Flora of the Rocky Mountains and adjacent plains, P. A. RYDER (New York: Author, 1917, pp. XII+1110).—This is a manual of the flowering plants, ferns, and their allies of the Rocky Mountain region, the area covered embracing Colorado, Utah, Wyoming, Idaho, Montana, Saskatchewan, Alberta, and neighboring parts of Nebraska, South Dakota, North Dakota, and British Columbia.

Marking microscope slides, MARY K. BRYAN (*Science, n. ser., 47 (1915), No. 1207, p. 171*).—The author briefly describes the use of a carborundum pencil for the marking of microscope slides.

## FIELD CROPS.

Relation of size of seed and sprout value to the yield of small grain crops, T. A. KIESSELBACH and C. A. HELM (*Nebraska Sta. Research Bul. 11 (1917), pp. 3-73, figs. 7*).—The authors report extensive investigations with wheat and oats to determine the extent to which differences in size of seed may affect the crop produced, superior yielding power having been frequently attributed to extra large seed. Sprout value is described as "the moisture-free weight of the maximum plant growth derived from the seed when planted and grown in a nonnutritive quartz medium and in absolute darkness."

The experimental work embraced the following lines of study: The relative sprout values of different grades of seed wheat, the relation of size and sprout value of seed to yield at different depths of planting, the effect of competition between plants grown from seeds markedly different in size and sprout value, the influence upon total yield of competition between large and small seeds, the effect of competition between varieties, the relation of size of seed to yield of wheat when various grades are planted alone in equal numbers, the reasons why small seeds yield less per acre than large seeds when planted in equal numbers at the normal rate for the large seed, the relative yields from large and small seeds when planted in equal numbers and at equal weights, and the relative yields of seed grades of wheat and oats as separated by the fanning mill. A historical summary of the experimental work of other investigators on the yielding qualities of large and small or light and heavy seeds is presented, including tests with winter and spring wheat, oats, barley, and rye. The loss of seed substance through respiration was determined by means of an especially

designed apparatus, and the loss not recovered in the vegetative growth or the inert seed residue partially accounted for. Considerable tabulated data are presented and fully discussed. The observations may be summarised as follows:

For all the grades of wheat seed tested in 1913 and 1914, the total sprout value of the seed averaged 54.2 per cent and 46.3 per cent of the weight of seed planted, respectively. The total loss of substance not recovered in either the sprout or the inert seed residue averaged 38.5 per cent for the two years. In all tests conducted during 1913 and 1914 the ratios for the moisture-free weight of unselected seed to the large and small seed averaged, respectively, 100:127 and 100:85, while the ratios for the total sprout value averaged 100:123 and 100:88, respectively, indicating a rather close relationship between the size of seed and its sprout value. As an average for three tests the carbon dioxide liberated from wheat seeds by respiration during fourteen days' growth in the dark in a nonnutritive medium amounted to 39.22 per cent of the original moisture-free weight of the seed, the sprout value of the same seed equalling 47.28 per cent of the original dry matter of the seed.

Very small or shrunken wheat seeds were at a marked disadvantage in comparison with large seeds, when planted at the unusual depth of 5 or 6 inches.

Separation of the mature crop of wheat, grown at the normal rate of planting, into individual plants was accompanied by an average error of 7.6 per cent, and for this reason the number of individual plants surviving from large and small seeds at harvest was not determined in these experiments. The relative production of large and small seeds of wheat was determined when planted alone and when grown in competition by alternating the seeds in rows planted at the normal field rate. The small seeds weighed 66 per cent as much as the large seeds and had a sprout value 68 per cent as large, the germinations of the two grades being practically equal. When planted alone the small seeds produced 6 per cent fewer culms, and in competition 18 per cent fewer culms than the large; the yield of grain was 11 per cent smaller when planted alone and 24 per cent smaller in competition; the yield of straw 6 per cent smaller for the small seed alone, and 25 per cent smaller in competition; and the total plant yield 7 per cent smaller for the small seed planted alone and 25 per cent smaller in competition than for the large seed.

That competition between alternating plants of two wheat varieties may be very marked was shown by Big Frame winter wheat in 1914, when grown at the normal rates of planting, the yields of grain, straw, total crop, and number of culms being respectively 90, 88, 89, and 80 per cent as large as for Turkey Red. When grown in competition, however, Big Frame yields were respectively only 55, 70, 67, and 68 per cent as large as for Turkey Red. Planted alone in 1915, the yields for Big Frame were respectively 82, 105, 99, and 94 per cent as large as for Turkey Red, and in competition were respectively 120, 128, 125, and 117 per cent as large. Similar results were obtained for spring wheat. These investigations are thought to indicate that competition may play a very important rôle in the natural improvement of cereal crops.

In a 2-year yield test of unselected, large, and small seeds of two winter wheat varieties, the average relative seed weights were 100, 134.0, and 86.9, with corresponding sprout values of 100, 133, and 92.3. The grain yield of the large seed was 2.3 per cent superior to the unselected seed and of the small seed, 3.1 per cent inferior. The 2-year average relative weights of unselected, large, and small seeds of two spring wheat varieties were respectively 100, 117.3, and 78.4, while the corresponding relative sprout values were 100, 110.4, and 71.8. The large seed outyielded the unselected for grain 11.8 per cent, while the small seed was 7.7 per cent inferior to the unselected seed. In these

tests, the seeds were planted in equal numbers at a normal rate for the large seeds.

When two grades each of spring wheat and oats were space-planted to permit maximum plant development, the small seed compared with the large produced 80 per cent as many culms per plant, 72 per cent as high grain yield, 77 per cent as high straw yield, and 77 per cent as great total yield, the small seeds averaging 52 per cent as heavy as the large. In yield tests comparing large and small seeds planted both in equal numbers and equal weights at rates normal for the large seed, (1) the small seed of winter wheat yielded 4 per cent less than the large planted in equal numbers, with equal yields when planted at equal weights; (2) the small seed of oats yielded 11 per cent less than the large when sown in equal numbers, both yielding alike with equal weights of seed; and (3) the small seed of spring wheat yielded 10 per cent less than the large seed sown in equal numbers, and only 1 per cent less when equal weights of seed were used.

During 12 years of continuous grading of Turkey Red and Big Frame winter wheat (by means of a fanning mill), the heaviest one-fourth seed averaged 0.4 bu. more, and the lightest one-fourth 0.5 bu. less than the unselected seed. For the same period the heaviest and lightest one-fourth seed of Kherson oats yielded, respectively, 0.83 bu. and 0.09 bu. more than the ungraded seed. During 8 years' continuous use of the fanning mill, the lightest one-fourth seed of American Banner oats has yielded 1.43 bu. more than the heaviest one-fourth. In a 4-year period the ungraded seed was also compared and yielded 1.6 bu. less than the light seed, while the heavy seed yielded 3.67 bu. less than the lightest seed.

Based on a review of 60 experiments by various investigators, regarding the relative yields of grades of small grain seeds, the following principles are indicated: (1) When space-planted to permit maximum development of the individual plants, a higher yield per plant is obtained from large than from small seed. (2) When planted in equal numbers at a rate optimum for large seed, a lower yield is obtained from small than from large seed. (3) When planted in equal weights, at a rate optimum for the large seed, all three grades of seed—large, small, and unselected—yield equally. (4) When distinct grades of light and heavy seeds (or small and large) are obtained from a fanning mill and planted in equal volumes slightly smaller yields are apt to result from the light seed. The difference in favor of large or heavy seed as compared with the original unselected seed is very slight and is deemed to have little practical significance, indicating that the practical use of the fanning mill consists largely in the removal of weed seeds and trash. (5) Competition between plants from large and small seeds sown in a mixture acts to increase the relative yield from the large seeds, suggesting a natural elimination (within a mass variety) of poorly adapted types which produce unduly small or light-weight seed.

The effect of weeds upon cereal crops, WINIFRED E. BRENCHELY (*New Phytol.*, 16 (1917), No. 3-4, pp. 53-76; *abs. in Physiol. Abs.*, 2 (1917), No. 4, pp. 368, 369; *Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 7, pp. 984, 985).—The author reports pot culture tests conducted at Rothamsted for the past four years with crops grown in association with weeds to determine whether vegetative competition is the sole factor suppressing the growth of crops or whether weeds excrete poisonous substances from their roots which actively inhibit growth. Wheat, barley, and buckwheat were grown alone and with *Alopecurus agrestis*, *Brassica alba*, *Papaver rhoeas*, and *Spergula arvensis*, respectively. The plan of the experiments is outlined in detail, and

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be results fully discussed. Tabulated data show the total dry weight of the shoots and roots of the crops and weeds, and the average dry weights of the shoots of each. In addition to the pot experiments, an attempt was made to throw some light on the question of toxicity by a series of water cultures made in 1915, in which wheat was grown alone and with *S. arvensis* and *A. agrestis*.

No evidence or indication was forthcoming to show that any toxic action was involved. It was obvious, however, that the mere competition of plant with plant, irrespective of species, had much to do with plant development, and that the time and duration of such a competitive check were the chief factors involved. Differences between pots in each set were regarded as accidental and not due to any inherent quality of the soil, as no definite correlation was observed between the 1915 crop from any one pot and the 1916 crop from the same pot. This is deemed to be further evidence of the absence of toxic substances, or at least of any toxin capable of remaining in the soil unchanged from one season to the next.

Wheat-rye hybrids, E. A. McFADDEN (*Jour. Heredity*, 8 (1917), No. 7, pp. 331, 336, fig. 1).—The author describes a wheat-rye hybrid secured from a cross of Turkey winter wheat with Swedish rye in the summer of 1915.

The most noteworthy differences between the hybrid and its parents were the number of spikelets on the normal spike and the length of the culms. The hybrid possessed 14 or 16 pairs of spikelets per spike, with culms intermediate in length between the two parents. The plant was thrifty in appearance and produced 25 vigorous culms that developed heads and also several tillers that did not develop fully. The first spikes to appear produced no seed, due to the failure of normal pollen grains to develop. A few of the flowers on later spikes were hand-pollinated with pollen from Kharkov winter wheat, resulting in the production of three seeds, two of which produced vigorous plants in the fall of 1916, although neither survived the winter.

Assuming that hardness is a recessive unit character, the author asserts that the hybrids could not be expected to survive a winter when nearly all unprotected wheat winterkilled. Working on this hypothesis, hybridization work along the same line was to be continued in the summer of 1917 on a larger scale, and the F<sub>2</sub> and F<sub>3</sub> plants carried through the winter in a greenhouse.

Winter forage crops, P. B. KENNEDY (*California Sta. Circ.* 189 (1918), pp. 11).—Brief notes are presented regarding the production and use of the following crops for winter forage in California: Field peas, common and hairy vetch, horse beans, rape, kale, giant marrow cabbage, white mustard, root crops, bar clover, sweet clover, miscellaneous grasses, rye, and barley.

Report of the department of agriculture [of New South Wales] for the year ended June 30, 1916, G. VALDER (*Rpt. Dept. Agr. N. S. Wales*, 1916, pp. 25-29, 36-42, 99-102, 109, 110, 113, 114-116, pls. 4).—Field tests at several experimental centers are reported with wheat, corn, oats, potatoes, cotton, rice, and numerous forage crops.

[Field crops work in Java], C. VAN ROSSEM (*Dept. Landb., Nijr. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab.*, No. 15 (1917), pp. 135).—Fertilizer and cultural experiments, chiefly with rice, and studies of economic phases of agriculture on the island are reported in detail for the year 1915-16.

The production of alfalfa seed in southern Idaho, L. C. AICHER (*Idaho Sta. Bul.* 101 (1917), pp. 20, figs. 9).—Approved methods of alfalfa seed production under irrigation in the Snake River Valley of southern Idaho are described, and production on dry land is briefly outlined. Alfalfa seed is said to be produced in this region at elevations ranging from 2,000 to 5,000 ft., the principal factors involved being climate, moisture, wind, and insects, especially

leaf-cutting bees. The yield of seed varies from 1 to 15 bu. per acre, experienced growers usually obtaining from 4 to 7 bu. per acre. Directions are given for harvesting and marketing the seed crop.

**Barley for New York**, H. H. LOVE and F. P. BUSSELL (*N. Y. State Col. Agr. Cornell Univ. Ext. Bul. 13 (1917), pp. 461-472, figs. 3*).—Variety tests with 2- and 6-rowed types of barley, begun in 1913, are reported for the 4-year period 1913-1916.

Of the 6-rowed varieties Featherston No. 7 gave the highest average yield for the 3-year period 1914-1916, amounting to 50 bu. per acre, while Manchury Selection N. D. A. C. 2125 was second with a yield of 45.4 bu. Guy Mayle was lowest with 25.8 bu. per acre. Manchury×Champion of Vermont No. 2 was best of the 2-rowed types, with an average yield of 47.1 bu., and Champion of Vermont second with 43.8 bu. per acre. Primus (Svalöf) was lowest with 29.2 bu. The average yield of the 5 best 6-rowed varieties for the 3 years 1914-1916 was 45.6 bu. per acre as compared with an average yield of 44 bu. from the best 5 2-rowed types. Commercial types deemed superior in yielding qualities include Champion of Vermont, Common Six-Row, Oderbrucker, Common Two-Row, and Silver King.

The effect of hydrogen and hydroxyl-ion concentration on the growth of barley seedlings, D. R. HOAGLAND (*Soil Sci., 3 (1917), No. 6, pp. 547-560*).—Having measured the hydrogen-ion concentrations of various soil suspensions representing soils of acid, alkali, and slightly alkaline types, investigations were undertaken to study the effect of similar hydrogen and hydroxyl ion concentrations in nutrient media where the numerous other variables of the soil could be eliminated.

Barley seeds were sprouted between layers of white paper toweling, and the seedlings transferred to 150-cc. bottles containing the culture media and grown for 14 days. The effect of the various solutions on the seedlings was determined from the general appearance of the roots and tops, the development of lateral roots and root hairs, and the dry weights of tops, roots, and residual seeds. In many of the experiments the fresh weight and average length of the tops were noted and microscopic examinations made of the roots. The hydroxyl-ion concentration of the solutions was controlled by varying the proportions of  $K_2PO_4$  and  $K_2HPO_4$ , and the hydrogen-ion concentrations by the use of  $KH_2PO_4$ , supplemented in one set by 1 per cent of  $H_3PO_4$ . Neutral solutions were used as checks. The hydrogen-ion concentrations of all solutions were ascertained by electrometric measurements.

The general effect of the higher concentrations of the hydroxyl ion was to decrease the fresh and dry weights of the tops and the average length. The development of lateral roots was almost entirely repressed, while microscopic examinations of the root tips indicated unquestionable injury. The leaves also gave evidence in many cases of toxicity. Concentrations of the hydroxyl ion greater than about  $1.8 \times 10^{-4}$  are considered detrimental to barley seedlings, while concentrations greater than  $2.5 \times 10^{-3}$  are considered extremely toxic.

Acid conditions are said to be favorable to the growth of seedlings in concentrations as high as  $0.7 \times 10^{-3}$  hydrogen ions. The fresh and dry weight of the tops and the average length increased over that of the neutral solutions. Lateral root development was good and microscopic examinations showed no evidence of injury to the root tips. These results substantiate those obtained by Totttingham (*E. S. R., 31, p. 425*) as shown by electrometric measurements of solutions similar to those employed by him in studies with wheat. Decided injury, accompanied a hydrogen-ion concentration of  $0.8 \times 10^{-3}$ , resulting in a

large decrease in dry weight, an unhealthy appearance and lack of lateral roots, and the death of the root tips.

Seedlings were also grown in  $\frac{N}{2000}$  potassium hydroxid and hydrochloric acid solutions and in a solution of acid potassium carbonate (500 parts per million). The hydrochloric acid solution proved fatal to the plants, while neither of the others caused perceptible injury. These results led to the conclusion that such dilute solutions were not capable of showing the effect of the hydroxyl ion on plant growth. The practical bearing of these studies on field conditions is briefly discussed, but no definite conclusions are reached.

Further data are presented which are held to indicate a general tendency on the part of the plant to so regulate the reaction of the media that excessive concentrations of the hydrogen or hydroxyl ion can not occur. Barley seedlings grown in potassium chlorid solutions of 500 parts per million total concentration gave no evidence of injury due to excessive hydrogen-ion concentration through the formation of hydrochloric acid as a result of the selective absorption of the potassium ion. The addition of aluminum to potassium chlorid solutions in which a number of barley seedlings were grown caused injury to the root tips and inhibited the formation of lateral roots.

Inheritance of endosperm color in maize, O. E. WHITE (*Amer. Jour. Bot.*, 1917, No. 7, pp. 396-406).—The author reviews and briefly summarizes the work of Lock, East (E. S. R., 22, p. 627), East and Hayes (E. S. R., 25, p. 736), Bart-Davy (E. S. R., 31, p. 331), Emerson, and Collins (E. S. R., 29, p. 34), and presents new data obtained from his own studies showing the growing complexity of facts and their interpretation in the heredity of endosperm color in maize.

California Golden Pop (Z 14) with yellow endosperm and a strain of white endosperm maize (Z 21), known as *Zea caragua* (E. S. R., 11, p. 23), were used as the parent strains, together with a white endosperm variety of Hopi maize. The  $F_1$  progeny of Z 14  $\times$  Z 21 gave uniformly white endosperm grains, while similar results were secured from a cross of Z 14 with the Hopi variety.

The  $F_2$  progeny of Z 14  $\times$  Z 21 numbered 9,663 individuals, 6,909 of which were classed as white and 2,664 as yellow. Assuming a one-factor difference between the two races, with white completely dominant or nearly so, the theoretically expected numbers would be 7,248 W : 2,416 Y. The yellow segregates presented all shades from a dark yellow (not orange) to a very light, lemon yellow on the same ear, while in some ears the yellow color was largely confined to the base of the grain.

From self-pollinated ears of the  $F_2$  generation approximately 1,000 plants were grown, giving  $F_3$  endosperm seed. Of these 43 ears were self-pollinated, 27 coming from  $F_2$  seed classed as white and 16 from  $F_2$  seed classed as yellow. Nine of the white seeds gave all white  $F_3$  progeny, while 19 gave both white and yellow grains approximating a 3 W : 1 Y ratio. The 16  $F_2$  seeds classed as yellow gave 14 all yellow ears and 3 ears with both white and yellow seeds, in a 3 W : 1 Y ratio. The yellow and white endosperm color varied markedly in this generation, due to a segregation of factors affecting the texture and the degree of translucency.

Unbagged ears of Z 14 grown in close proximity to varieties with deep yellow or orange endosperm color invariably developed a larger number of dark yellow or orange grains, from which a dominance of these yellows over that of Z 14 is to be inferred, as bagged ears always gave a uniform medium yellow. Unbagged ears of Z 21 grown under similar conditions have never been known



to develop yellow grains, while cultures of Z 21 grown beside F, and F, generation hybrids (Z 14×Z 21) have always been observed to produce only white ears.

In view of these observations the author concludes that the endosperm color differences between Z 14 and Z 21 may be regarded as due to the presence and absence of a single factor A. The presence of A prevents the development of yellow color when the factors for yellow are present, and does not reveal its presence in a variety which lacks these factors. In the absence of A a given variety may be either yellow or white. Assuming a factor Y for yellow pigment to be present in both races studied, *Z. mays* is regarded as homozygous for both A and Y, while California Golden Pop is homozygous for the presence of Y and the absence of A. It is pointed out, however, that, including the suppression factor A, at least three, and possibly five, pairs of factors are primarily responsible for endosperm color in maize.

**New place effect in maize**, G. N. COLLINS (*U. S. Dept. Agr., Jour. Agr. Research*, 12 (1918), No. 5, pp. 231-243).—The author describes experimental work with first-generation hybrids and a so-called pure strain of corn, grown in the same and in different localities as the parent stock to determine the effect upon yield of a change of place. The four varieties selected for the experiment were Stockton, Strawberry, Hickory King, and Boone. In 1912 each of these varieties was planted in rows alternating with Boone, including Boone itself, which was used as the male parent in making the hybrids, at Stockton, Kans.; Victoria, Tex.; and Lanham, Md. In 1913 the seed produced at the three localities was grown at each place, each hybrid, together with the pure-seed Boone, constituting a separate experiment involving only a comparison of the yield from the seed of the three localities. Seed of each sort from the different sources was sown in adjoining rows, and each series repeated ten times. Excessive drought destroyed the entire crop at Stockton. At the other points the corn from all the experiments was harvested on the same day, and the weight of ears and the number of plants recorded for each row. Tabulated data are presented showing the yields in pounds per row and per plant from the several rows, and the stand of plants secured from Maryland and Texas grown seed subsequently grown and compared in Maryland and Texas.

Regarding the ability to produce a stand as one of the manifestations of greater vigor, it was concluded from these preliminary results that "with all four kinds a comparison of the relative stand at the two localities is in favor of the transferred seed. In the Boone variety the transfer of seed has resulted in an 8 per cent increase of stand, a difference nearly four times the probable error. Since the analysis of the comparative stand of local and transferred seed shows that the differences are not accidental, but are consistently in favor of the transferred seed, it would seem that yield per row is a more reliable measure of comparative vigor than yield per plant. Yield per row is the measure of the practical results, and from this standpoint it is seen that all four strains showed an increase in yield as a result of transfer of seed. In Texas, where there was a definite tendency for an increased number of plants in a row to reduce the yield per plant, yield per plant is obviously ill-calculated to bring out the real difference in vigor."

To corroborate these conclusions, somewhat similar experiments were conducted at Greenville, Tex.; Sacaton, Ariz.; and Lanham, Md., during 1915 and 1916, employing the varieties named above. The crop was a failure at Greenville. To eliminate differences due to irregularities in the stand of plants, seed from Maryland and Arizona were planted in each hill, the source of the seed being indicated by the position of the plant in the hill. Measurements were recorded of the height of each plant and the total length of the ear or ears in

plants containing plants from both Maryland and Arizona grown seed. In 1915 the crosses were made by hand instead of by detasselling alternate rows as in 1911.

In spite of all precautions a certain measure of selection was thought to prevail, but it is concluded that "the entire effect of selection would be to favor the home-grown seed, and that the transferred seed was not superior to the home-grown in every instance may not be held to vitiate the cases in which significant differences in favor of the transferred seed were observed. The results indicate, however, that the stimulation is more pronounced in some stocks than in others. Thus, in the 1916 comparisons Boone×Hickory King stands out as a conspicuous exception. In all other stocks the transferred seed produced taller plants than the home-grown seed; but with Boone×Hickory King, the home-grown seed exceeded the transferred by 6.2 per cent, a difference not to be ascribed to chance, being more than eight times the probable error. Of the three stocks in which the yield was taken, Boone×Hickory King is also the only one to show superiority for the home-grown seed. Taken alone, the differences in yield could not be considered significant, but the agreement with the results for height confirms the reliability of these results."

The investigations are held to indicate the existence of a hitherto neglected factor in maize production, but much more extensive experiments are deemed necessary to determine its extent and practical importance. The experimental work reported is summarized as follows: "Hybrids between the same pairs of varieties made at different localities showed no decrease in yield as a result of transferring the first-generation seed to a new locality. On the contrary, the change of environment seemed to act as a stimulus, with the result that the yields were increased in all but one of the hybrids tested. One unhybridized variety was included in the experiment, and this also gave slightly increased yields as a result of being transferred to a new environment. In 6 of the 10 comparisons the increase is too large to be ascribed to experimental error and indicates that new-place effect should be taken into consideration as a factor of production. . . .

"There is no evidence that the importance of using acclimatized seed has been overestimated. On the contrary, the experiments show that new-place effect may often obscure the differences between acclimatized and unacclimatized seed when first compared, and thus interfere with a full appreciation of the value of adaptation. . . . The results also indicate that adaptation in maize comes about through selection rather than as a direct reaction to the environmental conditions."

Observations regarding the corn crop of 1917 (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 1, p. 26).—The results obtained with corn in five- and three-year rotations at Wooster (Ohio) under various fertilizer and manure treatments are briefly reviewed.

Grown continuously without fertilizer, corn yielded but 9.67 bu. per acre, while in a rotation of corn, oats, wheat, clover, and timothy it produced 80.28 bu. With applications of 12.5 and 25 tons of manure per acre in five years, corn grown continuously gave yields of 19.2 and 33.3 bu. per acre, respectively, while with an application of 16 tons in a five-year rotation it produced 75.86 bu.

Approximately 56 per cent of the Ohio corn crop is said to have fully matured in 1917, only about one-fourth being fit for seed and 39 per cent being described as soft and unmerchantable.

Selecting and testing seed corn, C. W. GOODMAN (*Texas Dept. Agr. Bul.* 53 (1917), pp. 23, figs. 10).—Detailed directions are given for the selection and testing of seed corn.

Cotton in the San Joaquin Valley, J. W. GILMONS (*California Sta. Circ. 226* (1918), pp. 8).—This circular briefly outlines the possibilities of cotton production in the region indicated, with special reference to the growing of Egyptian cotton. The soil, cultural, and moisture requirements of the crop are noted.

The adoption of a constructive policy embodying the economic features of labor, community organization and education, and the cultural features of soil preparation, planting, cultivating, irrigating, harvesting, and crop improvement is deemed essential in making the crop of permanent value to the agriculture of the State.

Cotton production in the United States: Crop of 1916 (*Bur. of the Census [U. S.], Cotton Prod. U. S., 1916, pp. 43*).—This presents tabulated statistics of the cotton ginned from the 1916 crop for the United States, for the several States, and for individual counties.

\* Oats investigations, T. A. KIESSELBACH and J. A. RATCLIFF (*Nebraska Sta. Bul. 160* (1917), pp. 4-48, figs. 17).—This reports on the status of oat growing in Nebraska on the basis of observations covering a long period of years, and including variety and selection tests, comparisons of irrigated and unirrigated oats for seed, a study of the effect of grading on the seed value of oats, rate-of-planting tests, notes on the relative yields of oats and other crops at Lincoln, and general observations on growing the crop and on substitute crops. Considerable tabulated data are presented and discussed.

The crop is said to be grown frequently at a loss in Nebraska, except in the northeastern part of the State. Early varieties are deemed superior to late varieties, tests covering a period of 15 years, 1902 to 1916, inclusive, showing an average yield of 54.7 bu. per acre for six early varieties as compared with 41.7 bu. for 13 late varieties. Similar tests covering a 12-year period, 1905 to 1916, showed an average yield of 58.3 bu. per acre for three early varieties and 47.2 bu. for four late varieties; while in tests covering a period of six years, 1911 to 1916, 4 early varieties showed an average yield of 56.4 bu., and 10 late varieties, a yield of 39.7 bu., there being an average difference of eight days in time of ripening for the last two periods. The best early variety was Burt, and the best late variety Swedish Select.

Forty strains of Kherson oats, originating from 750 head selections, have been grown for six years, 1911 to 1916, in the nursery, and 10 of these selections for four years, 1913 to 1916, in field plats. A white strain designated as Nebraska No. 21 is considered best, giving an average yield of 57.89 bu. per acre in the nursery and 61.9 bu. in field plats as compared with yields of 52.62 and 54.1 bu., respectively, for the original Kherson, and 64.5 and 62.3 bu. per acre, respectively, for Burt and Texas Red grown in the field during the same four-year period.

Kherson and Swedish Select unirrigated seed grown in eastern Nebraska produced an average yield for a five-year period, 1912 to 1916, of 47.6 and 33.6 bu. per acre, respectively, as compared with yields from irrigated seed grown in western Nebraska of 51 and 36.8 bu., respectively.

Fanning mill tests are noted from Research Bulletin 11, on page 732.

During five years, 1912 to 1916, large and small hand-selected seeds of Kherson oats were compared for yield when sown in equal numbers and equal weights per acre at an optimum rate for large seed. The average yield from seed planted in equal numbers amounted to 46.1 bu. for large seed and 40.9 bu. for small seed. In plantings of equal weights, a yield of 46.1 bu. was obtained from both large and small seed, and of 45.3 bu. from unselected seed.

Rate-of-planting tests extending over a period of 12 years are held to indicate that a rather wide range in rate of planting may prevail without materially affecting the yield per acre, but the data suggest a rate of from 10 to 12 pk. per

use for varieties of the Kherson type and of  $\frac{1}{2}$  pk. for those of the Swedish select type. Somewhat lower rates are deemed best for central and western Nebraska because of the less favorable moisture conditions.

Calculated in pounds per acre and allowing 30 per cent for hulls in oats, the relative grain yields of oats, corn, and winter and spring wheat for an eight-year period, 1909 to 1916, were 1,165, 2,576, 2,160, and 1,140 lbs., respectively. Assuming 30 per cent for hulls in oats and 15 per cent for hulls in barley, average yields of grain were obtained for a four-year period, 1907 to 1910, amounting to 1,147 lbs. per acre for Kherson oats, 1,750 for Oderbrucker spring barley, 1,186 for Tennessee winter barley, and 2,472 for Turkey Red winter wheat. Barley is deemed to be the best spring crop to substitute for oats.

Increased soil fertility, careful seed-bed preparation, early seeding, and treatment for smut are deemed important factors in successful oats production.

The deep-water paddy of Orissa, E. L. ROU (Agr. Jour. Bihar and Orissa (India), 4 (1916), pp. 66-69, pl. 1; abs. in Nature [London], 99 (1917), No. 239, p. 411).—Eight rice varieties adapted to growth in deep water (from 6 to 12 ft.) are briefly described and illustrated.

Soy beans, N. SCHMITZ (Penn. State Col. Ext. Circ. 59 (1917), pp. 16, figs. 1).—Soy-bean growing in Pennsylvania for forage and seed production is outlined and the use of soy beans as human food briefly discussed.

Selection experiments with Dell tobacco, J. A. HOSING (Meded. Delt-Proefst. Medan, 10 (1917), No. 5, pp. 79-128).—Extensive selection experiments with tobacco at several experimental centers are reported in detail.

The comparative anatomy of wheat, *Triticum albidum* and *T. erythrospermum*, M. KOMAR (Zhur. Opytn. Agron. (Jour. Agr. Expt.), 17 (1916), No. 6, pp. 370-399, figs. 16).—The author arrived at the following conclusions:

In *T. erythrospermum* the size of the epidermal cells which form the chlorophyll layer and integument was greater on the ventral side than on the lateral and dorsal sides.

Although *T. albidum* is of western origin, the prolonged culture (six years) and consequent adaptation to the conditions of the region made it difficult to discern in the anatomical structure of the grain the characteristics which would indicate its origin. Consequently, differences in structure were considered due to individual peculiarities of the plants which were all produced under constant climatic and soil conditions.

Measurements of the epiderm and of the chlorophyll layer did not show any significant difference between the two wheats, but in *T. erythrospermum* the exterior integument was found to be thicker, with the pigment more intense and with the cells larger. Moreover, very large stomata were observed which may indicate to a certain degree that more intense physiological phenomena took place in the life of the plant. A possible relationship was discovered between the aleurone cells, which were larger in *T. erythrospermum*, and an increased quantity of the fats of the albuminoid bodies as shown by microchemical reactions (osmic acid, eosin, Millon's reaction, picric acid, and nitric acid).

The pigment layer in the two wheats was composed of four layers of cells, the second from the outside being wholly colored. Two layers of cells lay below this pigmented layer, but their origin has not yet been definitely established.

The improvement of wheat [in Argentina], G. O. BACKHOUSE (Min. Agr. Nec. [Buenos Aires], Dir. Gen. Enseñanza e Invest. Agr. [Pub.] No. 73 (1917), pp. 72, figs. 17).—This is a general discussion of wheat improvement in Argentina through selection and variety testing in different sections of the country. A report of the work for 1915-16 is included.

**Geography of wheat prices.** L. B. ZAPOLEON (*U. S. Dept. Agr. Bul. 443* (1918), pp. 48, figs. 2, maps 4).—This bulletin presents a detailed study of the wide variations occurring in the producers' price of wheat throughout the continental United States, based on figures showing price averages by counties compiled from annual returns of some 30,000 township reporters for the five years 1910 to 1914, inclusive, and being a survey of the geography of wheat prices and price factors. The tabulated data are supplemented by maps and graphs showing geographic price zones and related factors.

The bearing of price factors on the indicated price differences is outlined in an empirical manner, these factors being described as complex, frequently interdependent, and not susceptible of absolute measurement. Price factors from 1871 to 1915 are briefly reviewed in an effort to trace present tendencies through their indicated development. In conclusion, the gross price of wheat is contrasted with the actual returns by coordinating prices, yields, and cost of production per bushel and per acre. The basic elements in geographic price differences are deemed to be population, production, demand, and indicated trade movement, the author stating that "farm prices group themselves geographically into zones responding to economic conditions attending the transit of wheat from areas of supply to those of demand."

The lowest farm price for wheat, 65 cts. per bushel, appeared in the surplus areas of Idaho and Montana, having small consuming populations and located most disadvantageously as to foreign markets. From this pivotal area, wheat prices graduated upward in every direction, following closely wheat movements toward areas of deficient production. Toward the Pacific they increased to the west and south, attaining a maximum of \$1 per bushel at San Francisco and in southern California, and toward the Atlantic they increased to the east and south, with a maximum of \$1.15 and over in the Southeast (chiefly in South Carolina and Georgia). Localities with higher or lower price levels than those of the surrounding territory sometimes occurred entirely subordinate to the general price current, responding to peculiarities of the commercial wheat movement.

Comparative stability and small local differences in prices were found in the great wheat-producing sections having a great volume of wheat traffic, competitive primary markets, and elaborate freight adjustments, whereas in regions having small wheat movements, greater price irregularity and higher prices obtained. A large part of the commercial wheat was found in a limited number of markets with highly organized distributive systems, each ordinarily receiving its supplies from some particular territory. "The largest single element in the regional price disparities is represented by freight rates. Though subject to change in their main features, they are constant in their influence on price conditions."

Based on summarized data showing average prices and cost of production for the period of 1911 to 1915, inclusive, it was noted that areas of high price showed minimum net returns, higher prices per bushel being offset either by high acreage costs or such relatively low yields per acre as to make the per bushel cost high. On the other hand, low prices per bushel with high yields showed high returns per acre at the lowest costs. The ratios of returns per acre or per bushel to cost, based upon average figures for the United States as 100 per cent, were 201 and 205 per cent, respectively, for Montana and Idaho, as compared with 155 and 139 per cent for South Carolina and Georgia, respectively.

In reviewing farm prices for wheat and price factors for the period of 1871 to 1915, inclusive, it was observed that the minimum farm price has moved steadily north and west, appearing in Nebraska from 1871 to 1875, in the Dakotas from 1891 to 1895, and in Idaho and Montana from 1911 to 1915.

During this period geographic differences in wheat prices, although still large, have narrowed notably, especially as between importing Eastern and exporting Western States, the diminishing price spreads being accompanied by decreasing transportation costs and the development of distributive methods, and also by a decline of wheat growing east of the Mississippi, as well as by a comparative concentration of the national wheat production within the Western North Central States.

Although wheat production in the United States practically trebled during the period of 1871 to 1915, in proportion to population it has remained stationary since 1882 to 1886, with 8.2 bu. per capita as against 8.3 bu. in 1911 to 1915. A notable and general decline was also observed in the proportion of wheat to total improved land within the wheat belt, showing that increased production was chiefly due to new areas brought under cultivation, together with some slight increase in the yield per acre. Wheat production east of the Mississippi dropped from 62.2 per cent of the total to 26.2 per cent, while that of the Western North Central States (including Minnesota, Iowa, Missouri, North and South Dakota, Nebraska, and Kansas) increased from 26.1 per cent to 51.8 per cent. It was only in the Mountain States (Montana, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, and Idaho) however, that any considerable recent growth in the ratio of wheat production to population was observed, due largely to new areas brought under cultivation, the per capita production in this region increasing from 0.8 bu. during the period 1871 to 1875 to 20.3 bu. in 1911 to 1915.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr.*, 1 (1918), No. 4, pp. 4).—Tabulated statistics are presented on seed stocks of cowpeas, soy beans, lespedeza, Sudan grass, sweet and grain sorghums, and millets based upon reports made December 31, 1917, by shippers; on forage plant seed permitted entry into the United States during January, 1918; and on a comparison of retail prices of vegetable seeds for 1918 with those for 1917 compiled from a large number of retail mail-order catalogues received from representative seedsmen.

Information relative to the clover-seed situation is presented, and jobbers' prices for country-run seed, and quotations on reclaimed seed, are briefly noted for millet, forage and grain sorghums, Sudan grass, alfalfa, sweet clover, and corn in the Missouri Valley.

The seed spring wheat situation in Minnesota, the Dakotas, and Montana is reported as generally favorable, and the quality of the seed as excellent.

Noxious weeds in New Zealand, A. H. COCKAYNE (*Jour. Agr. [New Zeal.]*, 14 (1917), No. 5, pp. 339-344).—From 669 replies to inquiries sent out to farmers by the New Zealand Department of Agriculture relative to the most serious weeds of arable and pastoral land, a tabulated statement is presented showing the 15 principal weeds reported for North Island and the same number for South Island. Ten weeds of the latter group are weeds of arable land as compared with only two of the former group, due to the difference in farm practice in the two localities. The State is divided into weed districts, giving the three principal weeds for each.

## HORTICULTURE.

Relation of the variability of yields of fruit trees to the accuracy of field trials, L. D. BATCHELOR and H. S. REED (*U. S. Dept. Agr., Jour. Agr. Research*, 12 (1918), No. 5, pp. 245-263, figs. 5).—In this paper the authors present the results of a study at the California Citrus Substation of the nature and extent of the casual variability of yields of fruit trees under field conditions and its bearing on the reliability of plat trials. The results of previous studies relat-

ing to the varying productivity of fruit trees, together with studies dealing with errors in field trials, are reviewed, and a bibliography of cited literature is appended.

The results of this investigation, which are presented in a series of tables and fully discussed, are summarized as follows: "Studies have been made upon the variability of the yields of orange, lemon, apple, and walnut trees. The orchards studied were selected on account of uniformity of treatment and appearance, yet the variability in productivity was considerable. The coefficient of variability for the yield of individual trees of the clonal varieties ranged from  $29.27 \pm 0.69$  to  $41.23 \pm 1.52$  per cent, but for the individual seedling walnuts the coefficient was somewhat higher, reaching  $53.91 \pm 1.92$  per cent. The variability of these tree yields approaches the normal curve of errors. This variability may be assumed to be the result of 'casual' factors which are beyond the control and possibly the recognition of a careful experimenter.

"The effect upon variability of combining trees into plots of various sizes and shapes has been investigated. As the number of trees per plot is increased, the coefficient of variability decreases. The coefficient of variability does not decrease, however, in proportion to the increased number of trees per plot. In most cases there is little gained in accuracy by increasing the plot to include more than eight adjacent trees.

"One of the great causes of variability in yields appears to be the heterogeneity of apparently uniform soil. While a combination of a sufficient number of adjacent trees into a plot will overcome largely the fluctuations of individuals, nevertheless the plots may not sufficiently include both high and low yielding areas to give a typical average. Greater reliability may be secured by a systematic repetition and distribution of plots through the experimental area. A consistent gain in reliability resulting from this method of repetition is shown by the use of several different methods of computing the variability.

"The coefficient of variability for an average plot of 16 adjacent trees was  $22.58 \pm 1.01$ , while 16 trees in 4 scattered ultimate plots each of 4 trees have a coefficient of variability of  $9.29 \pm 0.4$ . The larger the number of units in a combination plot the more typical is the sample of the area obtained. A 16-tree plot can be expected to give more reliable results if divided into four equal plots and repeated at four regularly placed intervals than can either two 8-tree plots, or 16 adjacent trees. The same principle holds true for larger units. A given number of unit plots will give a greater accuracy than half the number of units with twice as many trees per unit.

"Four repetitions of an ultimate plot reduced the coefficient of variability to a point considered practical for cultural operations. Further repetitions, though reducing the coefficient in less degree, did not appear to justify the additional number of trees required. A minimum of 8 to 10 trees is required for plots involving cultural experiments. In case of rootstock, pruning, or variety trials, twice as many plots each containing half as many trees might be used to obtain greater accuracy.

"The fact that marked soil variations occur which tend to make adjacent trees or adjacent plots yield alike, even on soils which were chosen because of their apparent uniformity, is well shown by applying the formula proposed by Harris [E. S. R., 33, p. 727] for measuring the coefficient of correlation between neighboring plots of the field. Applying this to the Arlington naval orange, the writers have calculated the correlation between the yield of the 8-tree plot as the ultimate unit and the yield of the combination of four such adjacent plots, and it was found that

$$r = +0.533 \pm 0.085.$$

-This result shows a marked correlation, indicating a pronounced heterogeneity in the soil of this grove influencing fruit production. However, when the correlation between the 8-tree plat as the ultimate unit and the yield of the combination of four such systematically scattered plats was calculated it was found that

$$r = +0.137 \pm 0.120.$$

-This coefficient is practically equal to its probable error and can be regarded as significantly zero.

-In the computations made by the writers emphasis is also laid upon the nature and magnitude of the probable error. It is shown in several cases that the probable error of comparison between plats may be so large that relatively large differences must be evident between treated and untreated plats for a reasonable assurance that it is due to the factors being experimented upon. With the plats of 16 to 32 adjacent trees which were studied, a difference of from 62.94 to 81.97 per cent of the mean production would be necessary in order to obtain chances of 10 to 1 that the results were due to differential treatment and not to casual variation in the productivity of the trees. With the same number of trees in scattered units, a difference of 28.42 to 50.02 per cent would be necessary for the same odds. It seems probable, therefore, that a difference between two tree plats of less than 50 per cent of the mean production should be considered with caution before attributing it to differential treatment.

-The relation between the shape of a plat and its variability was investigated by making comparisons between square plats and linear plats containing the same number of trees. Except in the case of large plats, the difference in the variability of plats of different shapes was insignificant.

-In any method of field experimentation where a standard of comparison is desired the theoretical or 'normal' yield of a plat is a question of importance. By the use of certain formulas the 'normal' yield may be computed from control plats. As a standard, one may use the average yields of the control plats of the entire area, or of the nearest control plats, or a combination of the two. In cases studied, the coefficient of variability was reduced 50 per cent by calculating the normal yield from the nearest controls in place of using the mean of the entire area. The employment of every alternate row as a control plat was not sufficient to offset the variability due to soil heterogeneity.

"Computations made on the yields of orange, walnut, and apple trees for several consecutive years showed little annual fluctuation in their variability. One of two crops may not show greater variability than the average of six or seven crops."

Factors influencing the abscission of flowers and partially developed fruits of the apple (*Pyrus malus*), A. J. HEINICKS (*New York Cornell Sta. Bul. 338* (1917), pp. 45-114, figs. 3).—This bulletin contains the results of observations and experiments made during the three seasons 1914-1916 with the view of determining the factors influencing the abscission of flowers and of partially developed fruits of the apple during the so-called June drop. The literature of the subject is briefly surveyed and a bibliography is appended. A popular summary of the work had been previously noted (*E. S. R.*, 33, p. 541).

The data collected during the course of the study and here recorded show the percentage of flowers developing fruits and of flower spurs retaining fruits after the first drop and after the June drop; the relation between amount of bloom and set of fruit; set of fruit on limbs with large leaves and on limbs with small leaves; set of fruit as influenced by the location of the spur on the twig growth of different years; set of fruit on spurs formed on different parts of a given year's growth; relation between the number of flowers to the spur



and ability of the spur to set fruit; relation between length of spur growth made during the preceding season and fruitfulness of the spur; relation between weight of flower-bearing spur and its fruitfulness; relation between weight of spur to the number of flowers and to the length of the previous season's growth; relation between the weight of the new spur growth and the diameter of the conducting tissue; relation between diameter of conducting tissue and weight of spurs, from limbs having a light bloom and from those having a full bloom; relation between water supply, leaf area, and pushing of buds; relation between amount of lateral growth from the flower-bearing spur and fruitfulness of the spur; relation between sap supply and fruit setting; fruit setting as influenced by varying amounts of leaf surface on the flower-bearing spur; influence of sunlight on the setting of fruit; relation between seed formation and fruit development; observations concerning some of the physiological effects of seeds; relations to be considered in choosing fruits borne under similar conditions; and experiments concerning the formation of the abscission layer, showing the effect of removing fruit and leaving varying lengths of stem, effect of coating fruit with vaseline to inhibit transpiration and exchange of gases, effect of slow and rapid drying of leaves on detached spurs with uncoated fruit and on detached spurs with vaseline-coated fruit, and the effect of a saturated and of a dry atmosphere on abscission of fruit on detached spurs.

The author found that from two-fifths to four-fifths of the total number of flowers are lost during the early drop, or within from one to four weeks after the petals fall, only 3 to 7 per cent of the total number of flowers finally develop into fruits, and from one-sixth to one-third of the flower-bearing spurs finally set fruit. The proportion of spurs that set fruit after the first drop and that hold fruit after the June drop varies with the variety, with individual trees of the same variety and on different limbs of the same tree.

Summing up the evidence as a whole, the author concludes that "the results presented . . . emphasize the importance of vigor, more especially the vigor of the individual spur, as a factor in fruit setting. As compared to weak spurs, the previous season's growth of vigorous spurs is longer, the new spur growth is heavier, the leaves are larger and more numerous, there are more flowers to the spur, the diameter of the conducting tissue is greater, and the weight of the lateral spur growth is greater.

"The vigorous spurs seem to favor fruit setting because they can supply the developing fruits with an abundance of water and food. Seeds appear to be valuable because they supplement the forces that bring sap to the fruit. Strong seeds are of primary importance for the setting of fruit on relatively weak spurs; they are of lesser importance for the setting of fruit on strong spurs.

"The number of strong seeds is dependent on effective fertilization, which in turn presupposes cross-pollination. Even though the grower may plant several varieties of the same fruit which bloom during the same time, nevertheless cross-pollination is frequently prevented by unfavorable weather during blooming time. Man has little control over the weather. On the other hand, man may influence the vigor of the tree by cultural methods. Trees in sod, for example, are usually less vigorous than trees in a tilled orchard. The latter, as a rule, produce heavier crops of fruit. . . .

"The application of a quick-acting nitrogenous fertilizer, such as sodium nitrate, early in spring may have a decided effect in stimulating early and rapid spur growth that would be likely to set fruit the following year. Some evidence for this suggestion is contained in the paper by Lewis and Allen [E. S. R., 35, p. 540] received by the writer while the present report was in the course of preparation. . . .

"The observations and experiments recorded . . . justify the tentative conclusion that unfavorable conditions of nutrition and water supply are among the basic factors which cause the normal drop of flowers and partially developed fruits of the apple. All factors that have a direct or an indirect influence on nutrition and water supply of the flower and the fruit, such as pollination, weather, cultivation, and the like, are of importance. Fruit development, however, is possible without cross-pollination and even under relatively unfavorable weather conditions, so long as the young fruit has an abundant supply of water and of readily available food."

The common honeybee as an agent in prune pollination, A. H. HENDRICKSON (*California Sta. Bul. 291 (1918), pp. 215-236, figs. 13*).—In some tent experiments conducted in 1916 (E. S. R., 36, p. 536) it was shown that bees are a necessary aid to pollination with the French and Imperial varieties of prunes. The study was continued on a larger scale in 1917 and is here reported on in detail. The tent experiments were so arranged as to test the effect of the absence of pollen-carrying agents, to study the question of interfertility or the necessity for interplanting for purposes of cross-pollination between the two varieties, and to determine the ability of each variety to set fruit with its own pollen. Counts were also made of the blossoms of each variety on trees growing in the open, in order to get the set of fruit that occurred under average orchard conditions.

Summing up the results of the two seasons' work, the author concludes that "both the French and Imperial prunes may be aided in setting fruit by the use of bees in the orchard during the blossoming period, provided the trees are in a normal, healthy condition. The absence of bees in the orchard may mean a low percentage of set with both of these varieties. The French prune does not absolutely require interplanting with the Imperial, even though this arrangement may prove beneficial to both varieties."

Pruning the seedless grapes, F. T. BIOLETTI (*California Sta. Circ. 191 (1918), pp. 12, figs. 10*).—This circular contains specific directions for the methods of pruning which have given the best results with seedless raisin grapes. Information is given relative to the treatment of young vines, trellising, and pruning bearing vines.

The mango in Porto Rico, C. F. KINMAN (*Porto Rico Sta. Bul. 24 (1918), p. 30, pls. 11*).—This bulletin embodies the more important results relative to mango culture in Porto Rico, based upon several years' work at the station during which trees of many varieties have been imported, propagated, and in some cases brought into satisfactory production. The important phases discussed include the soil and climate of Porto Rico, with special reference to mango growing, blossoming period, propagation, importance of classification, description of varieties, weights of different parts of fruits, protection against fruit flies, harvesting and packing, and mangoes as ornamentals.

The investigation as a whole has shown that imported varieties of mangoes superior to the common mango of Porto Rico can be grown successfully in practically all Porto Rican soils, provided that there is a good subdrainage and that they should be planted extensively for market and home use. Good crops are more certain along the western and northern lowlands of the island where the rainfall is light during the blossoming season. The prevailing winds and morning sun seem to be very beneficial both for the growth of the trees and setting of fruit; hence open, exposed sites should be selected for the orchard. Propagation both by inarching and by bark grafting has proved satisfactory for use in the nursery and for top working large trees. Large seeds which produce only one plant are most satisfactory for stocks. The East Indian varieties produce larger and more thrifty plants as a rule than the native mangoes. Both

nursery and other mango trees may be transplanted successfully if they are making a new growth and rainfall is plentiful.

The confusion in the classification of types of mangoes as well as the great variation in growth and productiveness of the trees and quality of fruit seriously handicap the present development of mango orchards in Porto Rico. Of the imported varieties that have fruited, the most productive of the thrifty kinds with fruits of high quality are Cambodiana, Totafari, Amini, Bennett, and Paheri. Of these, Cambodiana and Paheri appear to be better suited to home than to commercial use. Fruits of the native varieties and all varieties from Martinique, Trinidad, and South America are less desirable than many of the other imported kinds.

The station's work has shown that mangoes that have not softened on the tree should be picked with a stem longer than the fruit stalk so as to prevent the juice of the base of the fruit from escaping through the fruit stalk and leaving passages for the entrance of infection. Fruits in orange wrapping paper did not ripen or decay so quickly as those wrapped in oil paper, newspaper, or coconut fiber, or those left in the open air. Fruits packed in coconut fiber ripened earliest. East Indian varieties showed much better keeping qualities than the native varieties.

The author points out that the mango is one of the most satisfactory ornamental trees for Porto Rico and that it is possible to select from varieties producing fruit of high quality those which best carry out a particular scheme of landscape gardening.

**Report of the horticulturist, C. F. KINMAN** (*Porto Rico Sta. Rpt. 1916, pp. 17-21, pls. 2*).—A progress report on investigations with pineapples, coconuts, and mangoes, including notes on some miscellaneous introductions. The work with mangoes is reported on in a bulletin on page 747.

During the past two years the work with pineapples has included a comparison of the effects of nitrate of soda and sulphate of ammonia in a complete fertilizer. The results of these tests indicate not only that sulphate of ammonia is the most desirable source of nitrogen for pineapples in soils similar to that at the station, but that nitrate of soda should not be used for fertilizing pineapples in this soil type and that experiments should be conducted to determine its value in other soil types before it is used commercially. The plants receiving their nitrogen from sulphate of ammonia continued their vigorous growth and maintained their healthy color throughout the year, whereas those on the other plats, including the plats receiving nitrogen from nitrate of soda, made a very slow growth and remained abnormal in color.

In the fertilizer experiments with coconuts the plats receiving a complete fertilizer continue to produce much larger crops than those given an incomplete mixture, whereas in the group of plats where either nitrogen, phosphate, or potash is omitted from the fertilizer the yield is little heavier than that of the check plat. Complete fertilization has gradually increased the number of nuts harvested, but the average diameter of the nuts has remained practically the same throughout all plats in the experiment. Measurements made of the husks and nuts from a number of selected trees for several years have shown that the product from a given tree varies little in size and proportion of husk and nut from harvest to harvest. A study is being made of the progeny of seed from selected trees.

Twenty varieties of American-grown sweet potatoes, which were sent to the station by the Bureau of Plant Industry of the U. S. Department of Agriculture in 1911 and grown at the station, have all lost their characteristic flavor and at least some of them have developed a coarseness not common on the mainland. These importations are not in general superior in flavor or texture to the types

which have been grown in Porto Rico over a long period of years. A comparative test of a new stock of these varieties is to be made. Among the native sweet potatoes one with superior qualities, known locally as mamey, is being propagated for distribution.

Two types of the leguminous plant *Phaseolus mungo* received from the Philippine Islands have proved very thrifty and prolific at the station when planted during the spring, although poor crops have resulted from summer, fall, and winter plantings. The cooked seed of this plant is palatable as food and its heavy foliage makes it valuable as a soil improver or cover crop.

A variety of banana known as Hua Moa received by the station from Hawaii several years ago is giving some promise as a cooking banana, although it does not appear to thrive well except when given good applications of stable manure.

Report of the assistant horticulturist, T. B. McCLELLAND (*Porto Rico Sta. Rep. 1916, pp. 21-24*).—The testing of coffee varieties new to Porto Rico was continued and promising varieties are being distributed widely. Observations on an extensive planting of Robusta coffee indicate that it is inferior in quality to that of the Arabian type grown in Porto Rico, but its heavier yield makes it a promising crop for supplying a low-priced market. This coffee matures later than the native coffee, the main crop ripening in late winter and early spring rather than in autumn. This is suggested as being an advantage as it furnishes employment to pickers in a dull season. The rank growth of the trees necessitates topping to 7 or 8 ft. to facilitate picking. The coffee locally known as "Murta" has proved to be a mongrel and inheritance of different forms is being studied. The experimental transplanting of coffee trees continues to show wide differences both in growth and yield as the result of the method followed. This work is discussed in detail in a separate report (E. S. R. 37, p. 649). Fertilizer experiments with coffee continue to show beneficial effects, both on growth and crop, from the application of nitrogen. A native tree of dwarf growth (*Erythrina corallodendron*), not hitherto used locally as coffee shade, is being tested for this purpose. Plantings without shade of different coffee varieties are also being made to compare their relative vigor in the open.

Records have been kept of the number of pods produced on individual cacao trees for several years. Of plantings made in the spring of 1909 a little more than one-fourth of the trees produced no crop in the calendar year 1915. The others averaged nearly 10 pods per tree. In plantings made in 1908 about the same proportion of trees failed to produce but the average yield from the fruiting trees was 6.5 pods per tree. Attempts to propagate cacao from cuttings have been unsuccessful.

The experiments thus far conducted with vanilla show this to be a promising crop for Porto Rico. It requires careful attention and a great deal of labor, but with proper conditions large returns may be secured from a small acreage. In crossing vanilla species some very marked modifications, here noted, in the shape of the resulting pod have followed the application of foreign pollen. A new planting of vanilla has been made for further tests of the effects of light and dense shading, different pruning systems, the removal of superfluous blossoms, and the pollination of few to many blossoms per cluster.

Trees of mahogany (*Swietenia macrophylla*) continue to show adaptability to local conditions. In a planting made at the station the average height at 2 years from seeding was 16 ft., the maximum height 30 ft.

Bush beans in the greenhouse, S. N. GREEN (*Mo. Bul. Ohio Sta., 3 (1918). No. 1, pp. 16-20, figs. 2*).—Experiments on the greenhouse culture of bush beans conducted during the three seasons 1915-1917 are reported.

Of twelve varieties tested, the variety *Pleasant* gave the highest average yield of 6.4 oz. of green beans per hill for the three seasons, followed by *Canadian Wonder* with 5.9 oz. and *Sunrise* with 5.1 oz. per hill. The author points out that at present most of the varieties suited to greenhouse culture are of English origin, and that suitable varieties must be bred in America before the fullest returns can be expected from this crop.

In these experiments, the beans were planted in March and April. The average variety matured the crop in 70 days. There was no great difference between the yield of beans planted in hills and those planted in rows. Hills planted 12 by 18 in. apart with 2 plants per hill gave better average results than hills spaced 12 by 12 in. with either 2 or 4 plants per hill. With rows planted 16 in. apart, a 1-in. space between the beans gave somewhat better results than a 2-in. space. It is pointed out that planting distances must be determined for specific soil and other conditions.

A test of various soils indicated that nearly all greenhouse soils are suitable for forcing beans without more attention than is given tomato and cucumber soils, but that the bean crop should be watered more sparingly than the tomato or cucumber crop in order to keep the soil in good physical condition and to prevent the rapid spread of fungus diseases. An excess of water may also interfere with proper pollination of the flowers. Methods of controlling insects and diseases are briefly discussed.

**Heredity studies in the morning-glory (*Ipomoea purpurea*),** E. E. BARKER (*New York Cornell Sta. Bul. 392 (1917), pp. 5-38, pls. 3*).—This bulletin presents the results of experiments with morning-glory plants which were studied in pedigree cultures. Germinal analyses of them were made by means of crossing and subsequent selfing, supplemented by collateral breeding tests from the parents used in the crosses. The data secured are presented in a series of tables and fully discussed. A bibliography of cited literature is given.

The important results and deductions from the study are summarized as follows: "Several characters were studied which in heredity behaved in an alternative and Mendelian manner. These were color of the seed coat, feathering of the corolla, color of the corolla, and flaking of the corolla.

"The seed coat is either black or yellowish brown (tan). Black is the dominant color. Black, being the dominant color in the maternal somatic tissues, may lend character to the seed coat without giving any indication whatever of the nature of the embryo within it. A black seed coat may contain a homozygous or a heterozygous black embryo, or a homozygous tan embryo. A tan seed coat may contain a heterozygous black embryo, but never a homozygous black embryo. It may contain a homozygous tan embryo.

"Feathering of the corolla is a Mendelian character dominant over its absence. The color of the corolla differed in the several types in the series here studied. The types were progressively epistatic one to another from white through pink, magenta, and blue to dark purple.

"Anthocyanic colors are due to the action of enzymes upon colorless chromogens, producing thereby colored pigments. The color types studied in the morning-glory were in complete accord with the enzym theory. Each epistatic type is due to the addition of one or more genes probably enzymatic in nature which are not present in the hypostatic type. Flaking is a dominant character in the morning-glory material here studied. It is explained by a hypothesis supposing the character to be due to an enzyme which is locally distributed in the corolla and which reacts with a colorless chromogen to produce the colored flakes. Where it is present without the gene for producing solid color, flaked whites result; when present together with this gene, flaked solids are produced."

## FORESTRY.

A manual for northern woodsmen, A. CARY (*Cambridge: Harvard Univ. Press, 1918, rev. ed., pp. XIV+302, pls. 3, figs. 87*).—The present edition of this manual (E. S. R., 21, p. 241) has been brought up to date as concerns appliances and methods, and new matter and tables have been introduced that are mainly intended for the benefit of western woodsmen.

Annual progress report upon State forest administration in South Australia for the year 1916-17, W. GILL (*Ann. Rpt. State Forest Admin. So. Aust., 1916-17, pp. 12, pls. 6*).—A statistical review relative to the administration and management of the State forests of South Australia, including data on alterations in forest areas, planting and other forest operations, revenues, expenditures, etc.

A few notes on bamboos (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 3 (1917), pp. 85-87*).—Brief notes on the propagation of bamboos including descriptions of the most common species in Assam.

Incense cedar, J. A. MITCHELL (*U. S. Dept. Agr. Bul. 604 (1918), pp. 40, pls. 6, figs. 3*).—An account of the incense cedar (*Libocedrus decurrens*) of the Pacific Coast States, with reference to its commercial importance, products and uses, available supply, characteristics of the wood and tree, reproduction, range, silvical requirements, growth, stand per acre, enemies, management, and artificial forestation. Volume tables in cubic and board feet based on measurements in several National forests in California are appended.

Note on kokan or lampatia timber (*Duabanga sonneratioides*), R. S. PEARSON (*[Indian] Forest Bul. 36 (1917), pp. 8, pl. 1*).—This note deals with the general distribution, locality, and habit of kokan (*D. sonneratioides*) timber, together with its natural reproduction, rate of growth, distinguishing characteristics of the tree and timber, properties and uses of the timber, method of extraction, yields, and prices. The note is accompanied by an actual specimen of the wood.

Note on the contraction and warping which takes place in *Pinus longifolia* timber while seasoning, R. S. PEARSON (*[Indian] Forest Bul. 37 (1917), pp. 6, pls. 5*).—This note describes experiments undertaken to ascertain the amount of warp which takes place in *P. longifolia* timber when seasoned by different methods, and also an experimental test of the amount of contraction across the grain which takes place as the timber passes from a green to an air-dry state.

Comparative yearly volume increments of certain Indian tree crops. R. E. MANSOUR (*Indian Forester, 44 (1918), No. 1, pp. 10-16*).—Tabular data are given showing the comparative yearly volume increments of several Indian tree crops.

Imports of timber into British India during the years 1912-13 to 1916-17 (*Indian Forester, 44 (1918), No. 1, pp. 20-22*).—A comparative statement of imports of timber into India and Burma by sea from foreign countries during the last five years.

Lumber used in the manufacture of wooden products, J. C. NEELIS (*U. S. Dept. Agr. Bul. 605 (1918), pp. 17, figs. 2*).—This report presents statistics showing the average annual consumption of wood by the wood-working industries in the United States. The basic data were secured by a series of State wood-using industry studies. Those for the more important States have been published separately and have been noted in the Record from time to time. Although the State studies were begun in 1909 and were not completed until 1918, a period of 12 months was made the basis for the statistics for each State, and the final figures for the whole country here presented are considered

a very good average of the demand of each industry and the demand for each kind of wood. All imported woods used by factories are included in the statistics.

### DISEASES OF PLANTS.

**Embryomas in plants (produced by bacterial inoculations), E. F. SMITH** (*Bul. Johns Hopkins Hosp.*, 28 (1917), No. 319, pp. 277-294, pls. 28, fig. 1).—Having continued to experiment since reporting previously on the relation of crown gall of plants to human cancer (*E. S. R.*, 35, p. 545), the author offers further data on the production by bacterial inoculation of anomalous crown galls, which are considered as atypical teratoid tumors.

Such (embryonal) tumors have now been produced by the author on plants of 16 genera in 15 families. All that is necessary is to introduce the crown gall bacteria into the growing tissues of susceptible species in the vicinity of totipotent cells, which may be either dormant axillary buds or meristematic cells, remote from leaf axils and buds or bud anlage, these cells having the potentiality of germ cells whether they be somatic or germinal as regards origin. The principal genera used for the work here reported were *Nicotiana* and *Pelargonium*.

The present paper reports the result of efforts to produce hyperplasias in the middle of internodes remote from the usual points of origin of buds and shoots; to determine under what conditions tumors can be made to grow as ordinary sarcomata destitute of teratoid elements or to produce roots, leafy shoots, floral abortions, and mixtures of these; to determine what particular tissues may give rise to teratoids, and what can produce only sarcomata; to record photographically the inception, progress, and rapid proliferation and decay of these tumors; to demonstrate by photomicrographs the embryonic and fragmentary nature of deep-lying teratoid elements; and to show the existence of jumbled sarcomatous elements in their vicinity. Records were also obtained on fasciation and related abnormalities; on variation in the rate of tumor growth; on secondary infections; on the failure of tumors, after once starting, to continue to grow; and on the germicidal effect of collodion used to cover the wounded surface after bacterial inoculation.

**The British species of Phomopsis, W. B. GROVE** (*Roy. Bot. Gard. Kew. Bul. Misc. Inform.*, No. 2 (1917), pp. 49-73, pls. 2).—The two features considered most distinctive of the genus *Phomopsis* are the permanent sporophores and the nature of the pycnidium, the latter bearing little resemblance to that of a typical *Phoma*. The four chief accounts given of the genus by other authors since Saccardo are noted. The British list, which is more or less descriptive, includes 76 species. This is followed by a list of 21 species found elsewhere, and this by a discussion in this relation of *Phoma asparagi* and *Oytospora siccotoma*. A list of host plants is also given.

[Cotton rust investigations in Texas], **E. W. OLIVE** (*Brooklyn Bot. Gard. Rec.*, 6 (1917), No. 4, pp. 154-158).—The author investigated a sudden outbreak of cotton rust which was violent during May and June, 1917, in southern Texas, having spread supposedly from Mexico. The effects as noted some time after the violence of the attack had passed are briefly described. The crops in the area affected suffered a loss of probably from 20 to 70 per cent. Several rusted grasses were collected for examination, as the rust is thought to utilize some wild plant or plants as alternate hosts.

It is considered probable that the rust in question occurs sporadically every season, perhaps in many localities. The restricted area affected suggests that the infection of the grass host which is supposed to carry the alternate stage

must have been limited or else that the weather conditions in this vicinity were specially favorable this year. A similar rust is said to have appeared previously in California, Lower California, Mexico, Falfurrias, Tex., and Miami, Fla.

Peronospora on hemp. V. PHELION (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 26 (1917), I, No. 11, pp. 618-620).—The author reports having noted the presence of oospores in various cultures of a fungus on hemp which has been referred to Peronospora. On the basis of studies of this and related forms he holds that this organism should be referred to the subgenus Peronoplasmopara proposed by Clinton (*E. S. R.*, 17, p. 156).

Conditions influencing the distribution of potato blight in India, J. F. DARRIN (*Agr. Jour. India, Indian Sci. Cong. No.*, 1917, pp. 90-96).—The author discusses further (*E. S. R.*, 35, p. 150) the history of potato late blight (*Phytophthora infestans*) in various parts of the world as evidencing its inability to exist continuously at points having prolonged periods of temperature much above 77° F. He states that on the plains of India the fungus is normally unable to survive in soil or tubers, so that potatoes ordinarily susceptible to this disease may be grown if they are imported in summer when the temperature is sufficiently high to kill the fungus.

A potato parasite new to Italy, B. PEYRONEL (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 26 (1917), I, No. 9, pp. 509-512).—In the course of work with potatoes supposed to be completely sterilized in preparation for other work, a fungus appeared on the surface of the tubers which was found to be *Spondylociadium atrovirens* and which is briefly discussed. Since that time the author has seen this fungus in potato tubers produced elsewhere in Italy.

Irrigation experiments on apple spot diseases, C. BROOKS and D. F. FISHER (*U. S. Dept. Agr., Jour. Agr. Research*, 12 (1918), No. 3, pp. 109-138, pls. 4, figs. 10).—This paper deals with the effect of soil water supply upon bitter pit, Jonathan spot, and certain other nonparasitic spot diseases of the apple. It also includes notes upon the relation of the time of picking to the development of apple spots in storage. The experimental work on this investigation was carried on in the State of Washington.

It is claimed that bitter pit and Jonathan spot are readily distinguished from rosy-aphis stigmomose, drought spot, cork, and blister, bitter pit usually appearing first as spots of dead brown tissue in the subepidermal tissue of the apple. These spots are associated with the terminal branches of the vascular bundles, and in the later stages of the disease the browning often follows the vascular bundles deep into the flesh of the apple. Rosy-aphis stigmomose is said to be characterized by similar brown spots, the affected tissue being firmer than in the case of bitter pit and there being no association with the vascular bundles. The early stages of Jonathan spot are said to be confined to the color-bearing cells of the skin of the apple. Drought spot is characterized by the checking of the growth at certain points on the apple without the production of any large quantity of corky tissue. Cork differs from drought spot in the presence of comparatively large areas of corky brown tissue and in the fact that these areas are usually rather deeply seated in the flesh of the apple. Blister is the name given to superficial lesions associated with cork and characterized by a blister-like appearance.

Drought spot is said to be produced by sudden and extreme drought. Cork is apparently a drought effect, but it differs from drought spot in that its occurrence is usually associated with certain peculiar soil types.



Experiments have shown that there is a close relationship between the soil water supply of the orchard and the development of bitter pit in storage, heavy irrigation greatly increasing the disease, light irrigation reducing it. The lowest percentage of bitter pit was found on apples which received a heavy irrigation followed by a light one. Heavy irrigation seemed to favor slightly the development of Jonathan spot, but the contrast was so slight as not to justify definite conclusions. During the first weeks of storage more Jonathan spot developed on apples that were picked early than on those which were picked late, but as the period of storage was prolonged these contrasts seemed to disappear. The results, however, are believed to indicate a greater susceptibility to this trouble in the early-picked apples. Bitter pit was worse on Jonathan apples that were picked early than on those that were picked late.

The tar treatment for court-noué, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 8, pp. 173-175).—A discussion of reports and opinions by different investigators on court-noué as related to varieties and as affected by treatment with tar.

The results of treatment were either negative or inconclusive. The author states that the studies carried out at Montpellier for several years are still in progress regarding the characteristic internal changes, the conditions under which the trouble becomes evident, and the factors which may lead to its appearance.

Filage of grapes, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 20, p. 462).—This phenomenon, described as due to the arrest of floral development and excessive growth of the parts bearing flowers, is said to be related to disproportionate alimentation in cloudy or rainy weather and to be controllable by appropriate pruning operations.

Little leaf of grapevines in California, F. T. BIOLETTI and L. BONNER (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 22, pp. 517-522).—This is a résumé of a previous report (E. S. R., 36, p. 849) by the authors, who call attention to the resemblances and differences between this trouble and some others prevalent in Europe. It is distinguished from mal nero by a different kind of leaf coloration and by the fact that the latter is not transmissible but is confined to particular areas. An important character which little leaf has in common with court-noué is the shortened internodes characterizing the latter.

Grape downy mildew, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 12, pp. 269-277).—This is a discussion regarding what is known of grape downy mildew (*Peronospora viticola*); its mode of attack and development on vines, leaves, branches, and grapes; its propagation; climatic, cultural, and varietal conditions favorable or unfavorable to the disease; and remedial measures.

Grape downy mildew at Montpellier in 1916, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 16, pp. 365-373, fig. 1).—Having conducted an official investigation of the phenomena of grape downy mildew, the author states that the several invasions are each derived from a previous one. Except for a portion which is small and unimportant from a practical standpoint, they are due to rains or mists which are sufficiently heavy to bathe the upper surface of the leaf and run over to the other side, carrying the infecting spores. Each time favorable conditions occur a contamination takes place. Between this and the appearance of the invasion (in the form of sterile or fertile spots) is the period of incubation, the length of which varies from 4 or 5 to 7 or 8 days, according to the hygrometric condition of the atmosphere.

Grape downy mildew, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 24, pp. 557, 558).—Continuing the above work, the author reports that vines sprayed on May 19 remained clear of mildew, which was, however,

produced in other vines by the heavy rain (100 mm.) of May 20. The grapes showed the contamination three days later than did the leaves.

The length of the interval between contamination and the evidences of attack (incubation period) depends upon the temperature and humidity of the air, being shortest when these are 25° C. (77° F.) and 100 per cent, respectively. The conditions prevalent in early spring usually give an incubation period of seven days. From the first appearance of the white spots, each good rain produces an invasion seven days after the precipitation occurs. Spraying must be done about the end of this period to be effective. Applications made during a rain, except perhaps just at the beginning, are lost, the fungicide being washed away.

Rainfall and grape downy mildew, A. CADORET (*Prog. Agr. et Vit. (Ed. Est-Centre)*, 38 (1917), No. 25, pp. 588, 589).—A comparison in tabular form as regards precipitation is made between years of serious mildew attack (1910 and 1915) and years of relative freedom from such attack.

Spraying for grape downy mildew in rainy weather, A. CADORET (*Prog. Agr. et Vit. (Ed. Est-Centre)*, 38 (1917), No. 24, pp. 565-567).—The author views opinions regarding the advisability of the practice of spraying grapes for downy mildew during humid and rainy weather.

The treatment for downy mildew, L. TABOUREAU (*Prog. Agr. et Vit. (Ed. Est-Centre)*, 38 (1917), No. 11, pp. 255-258, fig. 1).—This is a discussion of spraying experience and observations of the biological and meteorological phenomena connected with the development of grape downy mildew.

It is stated that years of serious mildew outbreaks are not always years of heavy precipitation. Treatment is not effective if delayed for several days after a rain or after the general occurrence of conditions favoring spore germination.

Treatment of grape downy mildew in southwest France, J. CAPUS (*Prog. Agr. et Vit. (Ed. Est-Centre)*, 38 (1917), No. 19, pp. 444, 445).—It is said that in soils naturally dry in spring, as in those of Médoc or Graves (in Gironde), the invasions of downy mildew which ordinarily occur in regions of moister soils do not appear. The latter part of May or the first of June is usually sufficiently early for the first spraying. The most important period of contamination is about June 10, the corresponding invasion occurring about ten days later.

In other soils of the southwest of France the most important period for treatment is from May 15 to 31, though in case of very humid soils May 1 is late enough for the first treatment. Certain localities are supplied from the stations with special instructions regarding the time to spray. It is said to be impossible to fix the exact dates when spraying is required, as these vary from year to year, according to circumstances. Success in spraying depends upon thoroughness and care in applying 2 per cent copper sulphate.

Treatment of grape downy mildew, J. CAPUS (*Rev. Vit., 46 (1917), Nos. 1191, pp. 285-289; 1192, pp. 282-285*).—For the information of growers not so situated as to be supplied with information from stations regarding the time to spray in order to prevent outbreaks of grape downy mildew (see preceding abstract), the author states that the proper moment for the application of the spray is the most important question arising in this connection. The development of an outbreak presents three phases, namely, contamination, or penetration by the fungus, after its germination, into the plant tissue; incubation, or development of the fungus within the host, with little or no outward indication of its presence; and the appearance of the oil spots popularly termed the invasion. This development may require from 6 to 28 days, accord-

ing to temperature and humidity, and it can not be arrested at any stage beyond its inception, at which time, however, treatment properly used is absolutely effective. The primary infection develops from the bodies that have overwintered, and may occur several times. The secondary infection develops from the oil spots if conditions are favorable.

The progress of the mildew in the berries parallels that in the leaves, and both require thorough treatment.

In case of a single rain, contamination in a definite manner follows in a short time. In case of rains in close succession, repeated applications of the treatment are necessary until the end of the rainy period, particularly if this is accompanied by a lowering of temperature. Humidity and low temperature favor the development of the fungus and at the same time render the plants more receptive. During a certain period the young leaf or grape is particularly receptive to mildew, and during this time treatment should be prompt and thorough, employing a copper spray not lower than 2 per cent in concentration.

The comparative efficacy of acid and alkaline Bordeaux sprays, L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 7, pp. 149-155, fig. 1).—This is a discussion of the comparative merits of acid, neutral, and alkaline Bordeaux mixtures as reported recently by several investigators, giving prominence to the claim of superiority for the alkaline mixture made as a result of recent tests by Vermorel and Dantony (*E. S. R.*, 38, p. 158).

Acid and alkaline sprays, V. VERMOREL and E. DANTONY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 9, pp. 201-207).—This gives the details of the experimentation referred to above.

One series was continued for 16 days, the other for 50 days. Copper sulphate of 99.8 per cent purity was employed at 2 per cent strength in each series, the acid spray containing 0.32 per cent, the alkaline 0.96 per cent, calcium oxid. The greater persistence of the copper on the leaves in case of the alkaline spray was very marked as compared with that of the acid spray.

A second test employing the neutral in place of the acid spray showed this to give results approximately the same as regards the persistence of soluble copper on the leaves.

Acid and alkaline sprays, V. VERMOREL and E. DANTONY (*Rev. Vit.*, 44 (1917), No. 1192, pp. 285, 286).—In a statement supplementary to that above noted, the authors discuss acid and alkaline sprays in regard to their actual contents and qualities, so far as known. They claim that the acid preparation at 2 per cent strength is actually less efficacious than the alkaline mixture at half that concentration.

Acid and alkaline sprays, A. CADORET (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 17, p. 394).—In 1914 the use of acid Bordeaux spray was followed by the defoliation of the vines and the loss of the crop. In 1915, when an alkaline spray was used, the leaves were retained and the crop was normal. Lead arsenate appeared to improve the quality of adherence in the copper spray liquid.

Alkaline and acid sprays, L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 11, pp. 247, 248).—Noting an inquiry as to the meanings of the terms acid and alkaline as applied to sprays, the author states that the usual mixture of 2 per cent copper sulphate with 1 per cent lime is regarded as fully adequate and practically always alkaline, in spite of the usual impurity of the lime. The failure of the spray noted in Armagnac, where 12 or 14 sprayings are often insufficient to keep down black rot and downy mildew, is attributed to the climate, which is thought to be very favorable to mildew and black rot.

The greater duration of efficacy in case of alkaline sprays is admitted, but it is questioned whether the acid spray may not at the time of its application prove more effective against these diseases.

Mixtures of lime and sulphur, A. CADORET (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 11, pp. 258, 259).—Oidium of grapevines is said to be controllable by the employment of four or five applications of the residual sulphur obtained in certain industries. This should be mixed with lime or wood ashes in the ratio of 50:50 from the end of May to June 20 and in the ratio of 60:40 between June 20 and August 1.

Bust of grapevines, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 38 (1917), No. 20, p. 463).—Pending further study of the phenomenon, a brief description is given of an arrest of development in grapevines closely resembling that due to injury from strong copper sprays, but appearing on vines which have not been sprayed.

Report of the plant pathologist, E. W. BRANDES (*Porto Rico Sta. Rpt. 1916*, pp. 23-31, pls. 2).—In addition to an account of routine work carried on by the plant pathologist, a preliminary report is given of an investigation of banana wilt or Panama disease.

This disease, which seems to be particularly injurious to the Chamaluco variety, was previously reported in Porto Rico (E. S. R., 36, p. 352). The studies of the author have shown that it is due to a species of *Fusarium* which is indistinguishable from that previously described as *F. cubense*, an amplified technical description of which is given. Preliminary investigations have shown the possibility of controlling this disease by sterilization of the soil.

A more detailed account of the disease is to be given in a subsequent publication.

The geographical distribution of the citrus diseases, melanose and stem and rot, H. S. FAWCETT (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 194-195*).—This is a discussion of *Phomopsis citri* as an example of the failure of a parasitic organism to extend itself to the limits of the territory occupied by the host. In this case, it is suggested that humidity may constitute one factor, but it is of limited value as an illustration owing to the absence of melanose in southern Florida and in Cuba. Experimentation is now in progress regarding the temperature relations of this fungus.

Preliminary note on the relation of temperature to the growth of certain parasitic fungi in cultures, H. S. FAWCETT (*Johns Hopkins Univ. Circ., n. ser., No. 3 (1917), pp. 193, 194*).—This is an account of a study intended to compare the temperature-growth curves for cultures of a number of fungi producing diseases of citrus trees, but limited in their geographical distribution, with a view to the interpretation of the observed facts of distribution and seasonal occurrence and the suggestion of control measures. Cultures on solid media were studied as to daily growth under controlled conditions, and the results are detailed.

In marked contrast with the observed results reported by other workers, the author notes the fact that *Pythiacytis citrophthora* exhibited no time diminution of growth rate, which often continued unchanged for a period of eight days or more.

The June drop of Washington navel oranges, J. E. CORR and R. W. HODGSON (*California Sta. Bul. 290 (1918), pp. 203-212, figs. 3*).—A progress report is given of a study of the June drop of this well-known variety of oranges. In the previous publication (E. S. R., 37, p. 154), *Alternaria citri* was said to be the cause of the disease. Later investigation (E. S. R., 37, p. 834) seemed to indicate that abnormal water relations also influence the dropping of fruit.

The authors report that the major part of the June drop occurs early in the season and has to do with blossoms and small fruits. It is caused by a stimulus to abscission arising from abnormal water relations within the plant due to peculiar climatic conditions. The major part of the drop of the larger oranges is caused by the fungus *A. citri*. The drop caused by water relations is considered to bear a definite relation to climatic conditions, and all efforts looking to prevention or control must be either in the nature of modifying environmental conditions or in selection for dry heat resistant strains. Attempts to control the June drop by spraying have not given any promising results.

**Algal disease of cacao, J. B. ROXIE** (*Proc. Agr. Soc. Trinidad and Tobago*, 17 (1917), No. 9, pp. 345-348).—It is stated that an alga (*Cephaleuros virescens*) causes a leaf fall and die-back disease of cacao on practically every estate in Trinidad. This disease has been under observation since 1912 and has been described as attacking any cacao tree at any time during the year, but more readily during the last two months of the dry season especially if the trees are not in a good situation or condition. The disease has been called die-back and sun scald, but the author suggests the name of algal disease in order to distinguish it from true die-back and sun scald, which are said to be caused by a *Diplodia*.

Spraying with Bordeaux mixture has been attended by beneficial results, and attention to tillage, drainage, shade, and protection from wind are also considered essential to the complete control of this disease.

A full report of the disease, with illustrations, is to appear later.

**The diseases . . . of the coconut palm, R. M. RICHARDS** (*Agr. Bul. Fed. Malay States*, 5 (1917), No. 8-9, pp. 327-332).—In the section of this general review of coconut palm diseases and pests here noted the author discusses, together with other diseases in neighboring territory, bleeding disease (*Thielaviopsis ethacetica*), a leaf disease (*Pestalotzia palmarum* which may be intermingled with *Helminthosporium* sp.), a leaf breaking disease, supposedly due to *Botryodiplodia* sp., though other fungi may be present, bud rot (bacterial), and a sooty leaf fungus (*Meliola palmarum*). No root disease of coconut palm has been found in the region covered by this review.

**Leaf bitten diseases of coconuts, S. F. ASHBY** (*Jour. Jamaica Agr. Soc.*, 21 (1917), No. 7, pp. 269-273).—This is a discussion of pineapple leaf bitten disease (*Thielaviopsis paradoxa*), hard or little leaf bitten disease, and Phytophthora leaf bitten disease of coconuts as regards their causation, symptoms, and treatment.

**The white pine blister rust in Canada, W. A. McCUBBIN** (*Ann. Rpt. Fruit Growers' Assoc. Ontario*, 48 (1916), pp. 81-86).—In a somewhat general discussion of the white pine blister rust situation in Canada it is stated that observations in the Niagara district in 1916 showed that although the fungus may enter the limbs through wounds, the majority of infections seemed to occur by way of the leafshoots. From this point of entry the fungus grows in all directions in the soft bark, killing the tree eventually if it is weakly, otherwise causing a swollen and sickly appearance. A long time is required to kill a large tree, even if a number of infections work in different portions of it. The period between infection and spore formation varies from three to six years or more, but is usually about three and a half years.

During 1916 data were collected apparently supporting the conclusion that the fungus is able to winter on the currant, and thus live from year to year even when the white pine host is absent. Extended surveys in 1915 and 1916 showed that in addition to a large area of infection in the Niagara peninsula, isolated cases have occurred at Guelph, Brantford, Port Burwell, Dutton, Oak-

vile, Cookstown, Lindsay, Bowmanville, and Ottawa. At present only two points of infection are known in Quebec, namely, at Oka and St. Anne de Bellevue.

Diseases of the leaves and stem of *Hevea brasiliensis* in the Malay Peninsula. R. M. RICHARDS (*Agr. Bul. Fed. Malay States*, 5 (1917), No. 8-9, pp. 307-317; *Proc. Agr. Conf. Malaya*, 1 (1917), pp. 44-54).—It is stated that though the Para rubber tree has shown itself to be a particularly healthy plant in the Malay Peninsula, losses have occurred following improper or inadequate management. A species of *Phytophthora* which is said to cause an abnormal leaf cast from July to September in Ceylon has not been observed here. The most serious stem diseases discussed are those caused by *Corticium salmonicolor* (pink disease), *Phytophthora faberi* (bark canker), *Phytophthora* sp. (decay of tapped areas), and *Botryodiplodia theobromae* (die-back). The less harmful troubles are due to *Phyllosticta ramicola*, *Glaesporium albo-rubrum*, *Cyphella heresi* (thread blight), and burs in the tapped areas.

Clean clearing, pests, and disease, W. R. SHELTON-AGAR (*Agr. Bul. Fed. Malay States*, 5 (1917), No. 8-9, pp. 300-306; *Proc. Agr. Conf. Malaya*, 1 (1917), pp. 37-43).—This is a discussion of rubber tree pests and diseases. The diseases are classed as those that are fatal (requiring prevention) and those amenable to treatment. The fatal class include such diseases as *Fomes*, *Hymenochaete*, *Ustilina*, and *Poria*, and the amenable class stem and bark diseases such as *Diplodia*, pink disease, thread blight, and cankers.

The author gives results of experience in the control of *Terres gestroi*, and observations on the various seasons of fungus attack and on the control of disease.

Preventive measures against black thread (*Phytophthora faberi*), H. O. PLATT (*Agr. Bul. Fed. Malay States*, 5 (1917), No. 5-6, pp. 180-182).—This is a preliminary note on the causation, progress, and treatment of black thread of rubber trees in Sumatra.

The disease is favored by light rains and an overcast sky, but ceases in dry weather. It is more prevalent on flat land and on densely shaded areas. The attack is limited mainly to the first 20 in. of basal bark. The results of tests with fungicides are tabulated. Daily disinfection is considered necessary. For this purpose lizal is not so satisfactory as carbolineum. A 20 per cent strength lizal burns the delicate tissue of the tapped surface, but a 10 per cent strength has proved quite satisfactory.

Note on the development of chromogenic organisms in dry raw rubber allowed to become damp, B. J. EATON (*Agr. Bul. Fed. Malay States*, 5 (1917), No. 5-6, pp. 177-179).—The author has experimented in order to ascertain whether or not sheet rubber may develop spot diseases after being shipped in a perfectly dry and clean condition, owing to splashing or absorption of water. He claims to have found that such a change is possible, and that consequently carelessness or accidents at the shipping port may in this way injure sheet rubber in transit. It is stated that dry well-smoked sheet rubber may develop mildew, while low-grade rubber may ferment and become tacky. Thickness also appears to be a factor in susceptibility.

It appears that the presence of air is necessary for the development of the organisms or for the formation of pigments. Excessive moisture may retard or prevent the formation of the pigments which may develop after the moisture content is somewhat reduced, or it may be removed so quickly that the formation of the pigment may be prevented. These organisms may act on the protein or its decomposition products and destroy the accelerating agent, or may produce further cleavage.

## ECONOMIC ZOOLOGY—ENTOMOLOGY.

Review of the grizzly and big brown bears of North America (genus *Ursus*), with description of a new genus, *Vetularctos*, C. H. MERRIAM (*U. S. Dept. Agr., Bur. Biol. Survey, North American Fauna No. 41 (1918), pp. 134, pls. 16*).—In the present review the author describes 19 new species and 4 new subspecies and erects the new genus *Vetularctos*, of which *V. inopinatus* n. sp., the patriarchal bear, is the type. A total of 86 forms of the grizzly and big brown bears are recognized.

The rat as a carrier of *Spirochæta icterohæmorrhagica*, the causative agent of Weil's disease (*spirochaetosis icterohæmorrhagica*), Y. ITO, R. HOKI, H. ITO, and H. WANI (*Jour. Expt. Med., 26 (1917), No. 3, pp. 341-353*).—The author's findings, here reported, led to the conclusion that the extermination of rats and field mice is a highly important prophylactic measure against Weil's disease.

"The chemical composition of soil and water plays an important part in the development of *S. icterohæmorrhagica* and consequently in the spread of the disease of which it is a causative agent."

Animal parasites of rats at Madison, Wis., A. M. MOLL (*Jour. Parasitology, 4 (1917), No. 2, pp. 89, 90*).—In an examination of 25 rats captured in different parts of Madison, Wis., 53 per cent were found to be parasitized by fleas, 60 per cent by lice, 12 per cent by mites, 88 per cent by intestinal roundworms, 4 per cent by trichinæ, and 20 per cent by the dwarf tapeworm (*Hymenolepis diminuta*).

Investigations of the value of nitrobenzol as a parasiticide, with notes on its use in collecting external parasites, W. L. CHANDLER (*Jour. Parasitology, 4 (1917), No. 1, pp. 27-32*).—This is a brief report of investigations conducted to determine the action of nitrobenzol upon various animals when such animals are exposed to the vapor of this drug at various temperatures and for various periods of time.

The results show that it is impossible to predict just what effect any given condition of exposure to the vapor will have on an animal. The fact that it is impossible to kill either fleas or biting lice by any condition of exposure under that corresponding to 26° C. (78.8° F.) for six hours makes it clearly evident that this drug can not be used with any degree of safety in the fumigation of animals to destroy their external parasites.

Since it seems hardly probable that one hour's exposure to the vapor of nitrobenzol at temperatures between 20 and 25° C. (68 and 77° F.) will seriously affect any of the domesticated animals and fleas and biting lice become stupified after an hour's exposure at the same temperatures and are shaken off by the host in great quantities, it is quite possible that nitrobenzol fumigation may be used to good advantage in collecting specimens of external parasites.

A study of the toxicity of kerosene, W. MOORE and S. A. GRAHAM (*Jour. Econ. Ent., 11 (1918), No. 1, pp. 70-75*).—"Kerosene varies greatly in its physical characteristics and its chemical composition, even when coming from the same oil field. Low boiling point fractions of kerosene are in general more toxic to plants than high boiling point fractions when used pure. Injury by fractions with low boiling points can largely be prevented if they are applied to the form of an emulsion, since the emulsion holds the oil away from the plant until such time as it has evaporated. Emulsification of high boiling point fractions does not give this protection since the oil remains on the leaf after the emulsion is destroyed. Low boiling point fractions are more toxic to insects in the form of vapor than high boiling point fractions due to the slight vola-

any of the higher fractions. High boiling point compounds are more toxic than low boiling point compounds when used as contact insecticides in the form of an emulsion."

The distribution of bird life in Colombia; a contribution to a biological survey of South America, F. M. CHAPMAN (*Bul. Amer. Mus. Nat. Hist.*, 36 (1917), pp. X+722, pls. 41, figs. 21).—This report, based on 15,775 birds collected in Colombia, forms a part of an intensive zoological survey of South America, commenced by the American Museum of Natural History in December, 1916.

The first part of the work (pp. 3-169) includes a review of Colombian ornithology, a report on the American Museum's expeditions in Colombia, an outline of Colombian topography, remarks on the distribution of forests, notes on the climatology, the life zones of the Colombian Andes, the Tropical and Subtropical zones and their faunas, the Central American extension of the Subtropical Zone, the Temperate and Paramo zones, a tabular synopsis showing the zonal distribution of families of Colombian birds, etc. The second part (pp. 170-639) consists of a distributional list of birds collected in Colombia by the American Museum's expeditions in which 1,285 forms are represented.

A gazetteer of Colombian collecting stations, a list of 24 of the more important faunal papers relating to Colombian birds, and a subject index are appended.

Three new Mallophaga from North American birds, E. A. MCGEEON (*Ent. Soc.*, 23 (1917), No. 10, pp. 433-437, pl. 1).—*Goniodes zenaidura* from a mourning dove (*Zenaidura macroura*) at Aberdeen, S. Dak.; *Lamobothrium intermedius* from the sparrow hawk (*Falco sparverius*) from Minnesota and Uvalde, Tex.; and *Phytostomum melospiza* from the song sparrow (*Melospiza melodia*), St. Anthony Park, Minn., are described as new.

Eight new Mallophaga of the genus *Lipeurus* from North American birds, E. A. MCGEEON (*Psyche*, 24 (1917), No. 4, pp. 105-117, pls. 3).

Field book of insects, F. E. LUTZ (*New York and London: G. P. Putnam's Sons*, 1918, pp. X+509, pls. 24, figs. 628).—This pocket handbook deals with the more common insects under their respective orders and families, with special reference to those of northeastern United States. Keys are given for the separation of many of the groups, together with illustrations, many of which are in color. Habitat and plant and entomological indexes are included.

Report of the entomologist, R. H. VAN ZWALUWENBURG (*Porto Rico Sta. Exp.* 1916, pp. 25-28, pl. 1).—Work with ticks has shown both *Margaropus annulatus* and *M. annulatus australis* to infest cattle on the island, the latter being much the more common. From 20 to 22 days were required for the development of *M. annulatus australis* upon the host at Mayaguez. Under natural conditions at an average mean temperature of 74.7° F. in February the incubation period of the egg was 36 days, and at an average mean temperature of 79.6° in September, 23.5 days. The maximum longevity of larvae hatching in April was 94 days under natural conditions and 108 days when protected from rain and direct sunlight.

In collections made during the spring flight both sexes of the large common species of *Lachnosterna* were attracted to the light of a 400 candlepower gasoline lamp in about equal numbers, only 17 per cent of the females collected having completed oviposition.

A dark-brown cricket (*Amphiacusta caribbea*) severely injured seedlings of various kinds in the station plant houses. As many as 59 eggs were laid by one female in captivity, the eggs hatching in about a month. Flour and Paris green were used with success in controlling it.



Heavy summer and fall rains resulted in a very poor honey crop during the year. Weighing experiments with shaded and unshaded colonies showed that there was no striking or consistent difference in production.

Experiments with paraffin oil emulsion as a contact insecticide have shown it to be more effective than homemade lime-sulphur when used against Porto Rican insects. A serious outbreak of the yellow aphid (*Sitona favea*) on young sugar cane at Ponce is recorded, the growth of the cane having been severely retarded and in a few cases death resulting from its attack. The outbreak was eventually controlled by natural enemies. The occurrence of *Sterictiphora zoddachi*, the larvæ of which feed on leaves of sea-grape (*Coccoloba arifera*), and leuco (*Chrysobalanus icaco*) is noted.

Studies of the changa are noted below.

War on greenhouse pests, H. A. GOSSARD (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 1, pp. 21, 22, figs. 2).—In continuation of the paper previously noted (E. S. R., 38, p. 654) a brief account is given of control measures for greenhouse mites and cutworms.

Pecan insects, W. F. TURNER (*Go. Bd. Ent. Bul.* 49 (1918), pp. 6-37, pls. 12).—This is a general summary of information on the more important insects affecting the pecan, based upon investigations by the author and by C. S. Spooner in south Georgia, a brief report on which by Worsham has been previously noted (E. S. R., 38, p. 256).

The species considered are the pecan leaf case-bearer (*Acrobasis nebulella*), pecan nut case-bearer (*A. hebesella*), pecan cigar case-bearer (*Coleophora caryofoliella*), pecan budworm (*Proteopteryx boltiana*), pecan shuckworm ([*Enarmonia*] *Laspeyresia caryana*), fall webworm, walnut or pecan caterpillar (*Datana integerrima*), pecan catoculus (*Catocala* spp.), twig girdlers (*Oncidères cingulata*), flat-headed apple tree borer, *Chrysobothris scitula*, *Agrius anaxus*, cossid borer (*Cossula magnifica*), red-shouldered shot-hole borer ([*Sinosyrion*] *Xylebiops busilare*), pecan ambrosia beetle ([*Xyleborus*] *Xyleborinus pecanus*), lesser pecan tree borer (*Synanthedon* [*Sesia*] *gelliformis*), a pecan nut curculio (*Conotrachelus juglandis*), the hickory and pecan weevil (*Balaninus caryæ*), a leaf-feeding beetle (*Diplotaxis excavata*), a leaf-hopper (*Empoasca* sp.), pecan phylloxera (*Phylloxera* sp.), pecan aphid (*Monellia costalis*), and a spittle insect. A Farmers' Bulletin on pecan insects by Gill has been previously noted (E. S. R., 38, p. 157) as have investigations, by the same author, of the pecan leaf case-bearer (E. S. R., 38, p. 656).

The changa or West Indian mole cricket, R. H. VAN ZWALUWENBURG (*Porto Rico Sta. Bul.* 23 (1918), pp. 28, pls. 3).—This is a summary of the present status of knowledge of the changa, based upon a review of the literature and investigations conducted by the author, and replaces the bulletin by Barrett previously noted (E. S. R., 14, p. 885).

The changa is the most serious pest to general agriculture in Porto Rico, the general gardener sustaining the greatest losses from its attacks. Its injury is commonly caused by attacking the crown of the plant. It is shown that the species occurring in Porto Rico is *Scapteriscus vicinus* instead of *S. didactylus* as formerly supposed.

Life history studies have shown that there are usually eight molts, although occasionally there are but seven in the male. The entire period from egg to adult averaged 281 days for 11 males and 321 days for 7 females. The average duration of the instars of changas reared from the egg was 40.2, 29.4, 26.8, 27.5, 30, 47.5, 45.7, and 54.1 days, respectively. The preoviposition period of three individuals observed in the field averaged 79 days, 62 days having been the minimum and 93 days the maximum. The maximum number of eggs deposited

by a single female in captivity was 110, deposited in four lots. The duration of the egg stage averaged about 19 days, with variations from 15 to 38 days.

The natural enemies of the changa in Porto Rico are ineffective, an undetermined nematode being the single parasite that attacks it, though the fungus *Heterothium entomophilum* is thought to have killed some in the breeding cage. During the fall months the changa flies in large numbers on damp overcast evenings at which time the females in particular are attracted to light. Flooding is of value in control work wherever the location of fields makes water easily available as changa eggs fail to survive a submergence of 24 hours. Naphthalin and sulphur are the only repellents found to be of any value, and even they are only partially effective. Sugar cane is protected from the changa by planting it in a perpendicular or slanting position, and hilling up the plants greatly reduces injury by this pest in gardens. Poison baits, particularly one consisting of cheap flour and Paris green, together with clean cultivation, are recommended.

A list of 54 references to the literature is appended.

The citrus thrips, J. R. HORRAN (*U. S. Dept. Agr. Bul. 616 (1918), pp. 42, pls. 3, figs. 10*).—This is a summary of the present status of knowledge of (*Euthrips*) *Scirtothrips citri*, based upon the author's investigations in California and a review of the literature, including earlier reports of the Bureau of Entomology, previously noted (*E. S. R.*, 33, p. 354). The history and distribution of the citrus thrips, nature and extent of injury, dissemination, food plants, life history and habits, seasonal history, natural checks, natural enemies, and control experiments are considered and a bibliography of 16 titles appended.

Plain lime-sulphur solution, 1:56 of the 38° B. density or 1:50 of the 33°, is recommended as the most reliable of the four best mixtures resulting from the tests, a soda-sulphur solution being the next most effective mixture. The first application should be made when four-fifths or more of the petals have fallen, at which time the orange is most susceptible to deep injury by the thrips. The second application should be timed to prevent injury both from larvae issuing from the very young fruits and from adults emerging from the pupal stage existent at the time of the first application, i. e., from 10 to 14 days after the first spraying. The time of application of the third spray depends upon the effectiveness of the first two, it usually taking from three to four weeks for the thrips to again become dangerously numerous. "All three applications should be completed by the time the fruit is half grown, after which it rapidly loses its attractiveness for the insects, which then find it necessary to spread out over the comparatively scant tender orange growth and miscellaneous food plants.

"During the latter part of August and early in September there is usually another abundant growth of orange shoots, and upon this the thrips congregate in large numbers. A fourth application during this period is advisable in some seasons to prevent severe injury to this growth, which is often the most abundant of the season."

On nursery stock the first application should be made when the thrips become numerous on the spring growth and before their injury becomes very evident, usually between April 15 and May 15. From two to four further applications should follow the first spraying, depending upon the number of growths and the degree of infestation.

Catalogue of the Hemiptera of America north of Mexico, excepting the Aphididae, Coccidae, and Aleurodidae, E. P. VAN DUZEE (*Univ. Cal. Publ. Ent.*, 2 (1917), [No. 1], pp. XIV+902; rev. in *Science*, n. ser., 47 (1918), No. 1212, pp. 292, 293).—This catalogue undertakes to give a complete enumeration of

all the described Hemiptera, to and including the Chermidae, recorded from or known to occur in America north of the southern boundary of the United States. For the Heteroptera the Reuter classification of 1912 has been followed very closely, but the author has found it desirable to reduce a number of the families to subfamily rank. The international code has been followed in the determination of genotypes. A total of 3,198 accepted species are listed, of which 200 have been added since the publication of the author's check list in June, 1917 (E. S. R., 26, p. 550). The numbers given in the check list are retained and additional species interpolated in fractional form.

Additions and corrections are appended, together with a list of works cited and indexes to the genera and higher group names and species.

The review is by H. M. Parshley.

*Idiocerus scurra*, a poplar leaf-hopper, E. L. DICKERSON and H. B. WELLS (Jour. N. Y. Ent. Soc., 25 (1917), No. 4, pp. 218-224, pl. 1).—This is a report of morphological and biological studies of *I. scurra* (*I. gemmisimulans*), a poplar leaf hopper introduced into this country from Europe which is becoming more abundant and widely distributed in New Jersey, having been noted in several cases occurring on poplars growing along city streets.

*Gonatocerus ovicentus* has been previously recorded as parasitizing its eggs (E. S. R., 34, p. 637), and the authors have observed *G. maga* ovipositing in the tissue directly over *I. scurra* eggs.

The genus *Ophiderma* (Membracidae: Homoptera), E. H. GIBSON and EMMA WELLS (Jour. N. Y. Ent. Soc., 25 (1917), No. 4, pp. 199-203).—The authors recognize ten species of this genus as occurring in the United States, of which two are described as new to science.

The genus *Harmostes*, E. H. GIBSON (Ent. News, 28 (1917), No. 10, pp. 433-450).—A key is given for the separation of 16 species of this coreid genus, eight of which occur north of Mexico, one being described as new.

On the Chinese gall (Aphididae), A. C. BAKER (Ent. News, 28 (1917), No. 1, pp. 385-393, pl. 1).—The literature relating to galls produced by aphids on *Rhus semialata*, which for many centuries have been an important article of commerce in China, is brought together and the species compared with its well-known relatives in this country. The galls produced by this aphid are employed in dyeing and tanning, as well as in native medicines, and the export of these galls in recent years has amounted to a million dollars annually. A list of references appended consists of 35 titles.

The corn root aphid and methods of controlling it, J. J. DAVIS (U. S. Dept. Agr., Farmers' Bul. 891 (1917), pp. 12, figs. 6).—A practical summary of information in which the life history of this plant louse and its association with the cornfield ant (*Lasius niger americanus*) are graphically illustrated. Control measures include crop rotation, early and deep spring plowing followed by several deep diskings, the use of a substance offensive to the ants to be applied with a chemical fertilizer to prevent their colonizing the aphids on corn roots, and the maintenance of soil fertility through the use of barnyard manure or other fertilizer as an aid in producing stronger plants.

Control of the melon aphid, F. H. CHITTENDEN (U. S. Dept. Agr., Farmers' Bul. 914 (1918), pp. 16, figs. 9).—A popular account of this pest with directions for its control. The use of 40 per cent nicotine sulphate, 3 fluid ounces; water, 25 gal.; and laundry soap, 1 lb., is said to have given the best results thus far. The importance of using plenty of spray, 200 gal. to the acre, applied at high pressure, if possible, is emphasized.

Cattle lice and how to eradicate them, M. IMES (U. S. Dept. Agr., Farmers' Bul. 909 (1918), pp. 26, figs. 14).—A popular summary of information relative to sucking lice, their life history and habits, and methods of

treatment, including plans for a dipping plant. Arsenical dips, coal-tar creosote dips, and nicotine solutions may be used for dipping cattle to destroy lice, two or more treatments with one of which should be given 15 to 16 days apart.

Methods of control of the clothes louse (*Pediculus humanus* [vestimentii]), by MOORE (Jour. Lab. and Clin. Med., 3 (1918), No. 5, pp. 261-268).—The author's investigations here reported, conducted at the Minnesota Experiment Station, show that sachets (small bags) of naphthalene, camphor, sulphur, paradichlorobenzene, and various other chemicals, worn about the neck or the waist, are not successful in eliminating the body louse.

Take 20 gm., creosote 1 cc., sulphur 0.5 gm. is six times as effective a louse powder as NCI (naphthalene 96 per cent, creosote 2 per cent, and Iodoform 2 per cent), causing less irritation to the skin and, being dry, is easier to apply. Impregnation of the underwear does not appear promising, but a cheesecloth suit impregnated with saturated solution of sulphur in creosote could be successfully worn outside the underwear. Chlorpierin can be used as a fumigant, penetrating the clothing and killing the lice in all parts of the clothing in 15 minutes and the eggs in 30 minutes. By increasing the heat in the fumigation chamber, the time required to kill the eggs could be reduced.

[Papers on body lice] (Parasitology, 10 (1917), No. 1, pp. 188, pls. 3, figs. 17).—The articles here presented on body lice are as follows: Bibliography of *Pediculus* and *Phthirus*, including Zoological and Medical Publications Dealing with Human Lice, Their Anatomy, Biology, Relation to Disease, etc., and Prophylactic Measures Directed Against Them (pp. 1-42), The Part Played by *Pediculus humanus* in the Causation of Disease (pp. 43-70), and The Biology of *P. humanus* (pp. 80-185), by G. H. F. Nuttall; and Notes on Head and Body Lice and upon Temperature Reactions of Lice and Mosquitoes, by F. M. Hewlett (pp. 186-188).

The pink bollworm of cotton, E. E. SCHOLL (Farm and Ranch, 36 (1917), No. 50, p. 2, figs. 4).—A brief account of the appearance of this pest in Texas and measures taken for its eradication. A law enacted by the Texas legislature which became effective December 28, 1917, makes it possible for the governor to quarantine any county or area where the pink bollworm is found and he may, upon the advice of the U. S. Secretary of Agriculture, restrict and regulate the growing of cotton in the border counties when the pink bollworm is found in Mexico within 50 miles of the Rio Grande.

Report on the pink bollworm in the cotton districts of northeastern Brazil, A. M. DA COSTA LIMA (Relatorio sobre a Lagarta Rosca do Capulho (Pink Bollworm) nos Algodoeiros do Nordeste. Rio de Janeiro: Govt., 1917, pp. 50, pls. 4; rev. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 12, p. 537).—This is a report to the Brazilian minister of agriculture on the pink bollworm (*Gelechia* *Pectinophora gossypiella*) in Brazil, accounts of which pest in that country by Hunter (E. S. R., 37, p. 358), Busck (E. S. R., 37, p. 564), and Green (E. S. R., 38, p. 562) have been previously noted.

Notes on its natural enemies and on other cotton pests in northeastern Brazil are included, as is a bibliography of 28 titles.

Outbreaks of the elegant looper (*Phyllocnistis elegantaria*) on privet in Louisiana, E. S. TUCKER (Ent. News, 28 (1917), No. 9, pp. 394-396).—These notes relate to the occurrence of the elegant looper on Amoor privet (*Ligustrum amurense*) at Baton Rouge, La., in May and June, 1913. There was a high percentage of parasitism by *Chalcis ovata*, and specimens of *Eutelus* sp. and *Phorocera* (*Euphorocera*) *claripennis* were also reared.

Descriptions of some lepidopterous larvae from Mexico, H. G. DYAR (Inspector Insectis Menstruus, 5 (1917), No. 7-9, pp. 128-132).

A new pyralid from California, H. G. DYAR (*Insector Inscitiae Menstruus* 5 (1917), No. 7-9, p. 132).

*Brabantia rhizoleuca*, redescribed, H. G. DYAR (*Insector Inscitiae Menstruus*, 5 (1917), No. 10-12, p. 169).

The genus *Culex* in the United States, H. G. DYAR and F. KNAB (*Insector Inscitiae Menstruus*, 5 (1917), No. 10-12, pp. 170-183).—The author presents notes on 17 species of *Culex*, including two new species; and on three additional species belonging to other genera. A table for the separation of subgenera of *Culex* by the male genitalia and a table for the separation of species of *Culex* by coloration are included.

The mosquitoes of the Pacific Northwest, H. G. DYAR (*Insector Inscitiae Menstruus*, 5 (1917), No. 7-9, pp. 97-102, pl. 1).

The larva of *Aedes idahoensis*, H. G. DYAR (*Insector Inscitiae Menstruus* 5 (1917), No. 10-12, pp. 187, 188).

A second note on the species of *Culex* of the Bahamas, H. G. DYAR (*Insector Inscitiae Menstruus*, 5 (1917), No. 10-12, pp. 183-187).—This second note (E. S. R., 34, p. 553) gives a list of mosquitoes of the Bahamas collected in 1903 by T. H. Coffin,<sup>1</sup> together with the corrected nomenclature as supplied in the monograph of Howard, Dyar, and Knab (E. S. R., 37, p. 762). A description of one new species and records of two additional forms are included.

*Dytiscus* as a destroyer of mosquito larvae, F. E. CHESTER (*Ent. News* 28 (1917), No. 10, p. 454).—The author finds that while dytiscid larvae may be of considerable importance in killing mosquito larvae when the latter are present in great numbers, complete extermination by them where the mosquito larvae are widely distributed is not probable.

New American mosquitoes, H. G. DYAR and F. KNAB (*Insector Inscitiae Menstruus*, 5 (1917), No. 10-12, pp. 165-169).—Four species of mosquitoes are here described as new.

Notes on *Aedes curriei*, H. G. DYAR and F. KNAB (*Insector Inscitiae Menstruus*, 5 (1917), No. 7-9, pp. 122-125).

Notes on *Aedes* at Lake Pend d'Oreille, Idaho, H. G. DYAR (*Insector Inscitiae Menstruus*, 5 (1917), No. 7-9, pp. 102-104).

Notes on the *Aedes* of Montana, H. G. DYAR (*Insector Inscitiae Menstruus* 5 (1917), No. 7-9, pp. 104-121).

A new *Aedes* from the Rocky Mountain region, H. G. DYAR (*Insector Inscitiae Menstruus*, 5 (1917), No. 7-9, pp. 127, 128).

A note on the mode of existence of flies during winter, R. P. McDONNELL and T. EASTWOOD (*Jour. Roy. Army Med. Corps*, 29 (1917), No. 1, pp. 98-100).—The continued occurrence of adult flies in houses, hutments, and elsewhere in France following a few days of sunny weather, notwithstanding the extreme cold experienced in the latter part of February and early part of March, led the authors to conduct the investigations here reported.

No hibernating flies could be found, but examinations of manure heaps indicated that eggs deposited in late autumn and covered over or otherwise buried in the heap may hatch as a result of the warmth in the depths of the manure. Such larvae continue to feed and eventually pupate, in which stage they may remain until spring or appear as adult flies hatched out by a few warm days the heat of which has penetrated the superimposed layers of manure, thus accounting for the fact that adult flies are frequently encountered in wintertime. The finding of living fly larvae and pupae in such numbers in manure heaps is considered remarkable on account of the extreme cold during the late winter, when from 18 to 20° of frost were experienced for many days.

<sup>1</sup> The Bahama Islands, edited by G. B. Shattuck (New York: The Macmillan Co., 1905, pp. 275-289).

It would appear that manure heaps may be a source of danger at any time of the year, and if the spread of flies is to be prevented, manure should either be burnt, or spread out in thin layers; dumping in the immediate vicinity of camps and buildings should be avoided. Covering over the heaps with earth, or sowing the surface with grass or other seeds, would appear to be of doubtful value once eggs are deposited in the manure.

In the month of March, the presence of living fly larvæ was demonstrated in a mixture of earth and human excreta made six months previously; it would seem therefore that reliance can not always be placed on the method of disposal in shallow trench latrines as a preventive of fly breeding; in some soils the disappearance of excreta is slow."

Interrelations of fruit-fly parasites in Hawaii, C. E. PEMBERTON and H. F. WILLARD (U. S. Dept. Agr., Jour. Agr. Research, 12 (1918), No. 5, pp. 285-295, pls. 4).—This is a report of studies made in connection with the work previously noted (E. S. R., 38, p. 659).

The observations have shown that where Mediterranean fruit fly larvæ have been parasitized by both *Opius humilis* introduced from South Africa and *Diachasma tryoni* introduced from Australia, *O. humilis* was killed and *D. tryoni* developed to maturity. *D. fullawayi*, a later introduction, and *D. tryoni* have been responsible for the great suppression of *O. humilis*, which is more hardy and prolific than either of the two species of *Diachasma* and more generally efficient than both combined. *Tetrastichus giffardianus*, a late introduction into Hawaii, has proved decidedly destructive to any of the oöplines when occurring in the same fly larvæ or puparia with them, and has given but small promise of accomplishing any perceptible control of the fruit fly.

It is thought that sufficient evidence is presented to prove the superiority of *O. humilis* over the other introduced fruit fly parasites in Hawaii, and to demonstrate the decided restraint operated over it by the unflinching cannibalistic activities of the larvæ of *D. tryoni* in particular and of the other parasites in part. Since *O. humilis* has a capacity of parasitizing from 80 to 90 per cent of the larvæ of the fruit fly in favorable localities, such as the large Kona coffee belt, the authors maintain that detrimental results to a certain extent have arisen from the liberation in Hawaii of parasites other than *O. humilis* that attacked the larvæ of the fruit fly. As a result the total parasitism has been reduced to that of a parasite of secondary value.

A new oratid from the Philippines, F. KNAB (*Insector Insectorum Menstruus*, 5 (1917), No. 7-9, pp. 125-127).

New genera of Amoblinæ, C. H. T. TOWNSEND (*Insector Insectorum Menstruus*, 5 (1917), No. 10-12, pp. 157-165).—In this paper, which deals with one of the two subfamilies of Sarcophagidæ, the author erects 11 genera and describes the type species of three.

Five new species of North American Tachinidæ, H. E. SMITH (*Psyche*, 24 (1917), No. 5, pp. 137-141).—*Homaonychia rapa*, one of the species here described as new, was reared from the imported cabbage worm at Melrose Highlands, Mass.

The white grubs injuring the sugar cane in Porto Rico.—I, Life histories of May beetles, E. G. SMYTH (Jour. Dept. Agr. P. R., 1 (1917), No. 3, pp. 141-146).—This is a continuation of the report of investigations of the May beetles previously noted (E. S. R., 38, p. 161).

The infection of *Phyllophaga vandinei* n. sp. with *Metarrhizium anisopliae* and *Micrococcus nigrofaciens* is first reported, followed by accounts of work with the common white grub (*P. portoricensis* n. sp.), the south coast white grub (*P. guianensis* n. sp.), the citrus white grub (*P. citri* n. sp.), and the

little brown May beetle (*Phytalus insularis* n. sp.), previously referred to as *Lachnosterna* "grande," "media," "media (northern form)," and "pequeña," respectively (E. S. R., 36, p. 753). As with *P. vandine* the life cycle of all four of these species covers just one year.

Synopsis of the coleopterous family Cistidae (Cioidea) of America north of Mexico, C. DURY (*Jour. Cincinnati Soc. Nat. Hist.*, 22 (1917), No. 2, pp. 1-27).—The beetles of this family are said to live in woody fungi of the different polyporoid kinds. "The North American species are of but little economic importance so far as is known, though they and their larvae are voracious feeders on the substance of the inner parts of woody fungi."

How to reduce weevil waste in southern corn, C. H. KYLE (*U. S. Dept. Agr., Farmers' Bul.* 915 (1918), pp. 7, figs. 3).—It is pointed out that a great increase in loss results when corn is stored with short, loose shucks, and that such corn should be fed or sold as rapidly as possible. Corn in which the shucks extend beyond the tips of the ears and close tightly about the silks is weevil proof, both in the field and in storage. When necessary to store corn that does not have good shuck protection, the damage can be reduced by shelling, cleaning, and placing the corn in bags of closely woven cloth.

A key to the known species of South Carolina ants, with notes, M. I. SMITH (*Ent. News*, 29 (1918), No. 1, pp. 17-29).

Notes on parasitic Hymenoptera, A. A. GIRAULT (*Bul. Brooklyn Ent. Soc.*, 12 (1917), No. 5, p. 118).—The tetrastichinid genus *Neomphaloidomyia* is erected and two species described as new. One of these, *Hypopteromalus persecutor*, was reared from the larvae of *Zothea tranquilla* at Wenatchee, Wash.

New Australian chalcid flies, A. A. GIRAULT (*Insector Inscitia Menstrua*, 5 (1917), No. 7-9, pp. 133-155).—This paper, which is in continuation of the previously noted (E. S. R., 37, p. 569), contains descriptions of 29 new species and nine genera are erected. Among the new species is *Dibrachys australis*, reared from the codling moth at Glen Innes, N. S. Wales.

The North American species of *Trigonoderus*, females, A. A. GIRAULT (*Ent. News*, 28 (1917), No. 9, pp. 396, 397).—Five species of the genus are recognized, of which four are described as new.

Ichneumon v. *Apanteles*, H. DONISTHORPE (*Ent. Rec. and Jour. Variation*, 29 (1917), No. 11, p. 231).—These notes relate to observations of the braconid parasite *Apanteles glomeratus* and two ichneumonids (*Hemiteles fulvipes* and *Panargyrops pellucidator*), all reared from *Pteris brassicae*.

## FOODS—HUMAN NUTRITION.

Proceedings of the Twenty-first Annual Convention of the Association of American Dairy, Food, and Drug Officials (*Amer. Food Jour.*, 12 (1917), No. 9, pp. 453-500).—The proceedings of this convention, held in Atlantic City from July 31 to August 3, 1917, are given in full. The subjects under discussion included Grades for Canned Corn, Peas, and Other Foods; Commercial Edible Fats; Sanitation and Health from the Food Standpoint; Report of the Committee on Swells and Springers in Canned Goods; the Law as Laid Down in the Iowa and Pennsylvania Department of Ice Cream Cases; the Essentials for Clean Milk Production; and the Use of Inferior Ingredients and Cheap Substitutes.

Native wild mushrooms for food (*Missouri Bot. Gard. Bul.*, 5 (1917), No. 8, pp. 119-129, pls. 7).—A discussion of the food value of mushrooms, method of preservation, and means of distinguishing the edible from the inedible varieties.

**Food supply in families of limited means.**—A study of present facts of the food problem in Boston families, by six welfare agencies, members of the League for Preventive Work, M. M. DAVIS (*Boston: League for Preventive Work, 1917, pp. 24*).—The author concludes from this study that "the general public needs to be much more fully awakened to the serious effect of present food prices upon the nutrition of families of small means, particularly families in which there are many young children." An increase of income as well as food instruction may be necessary in the lower income group. "Present food conditions obviously demand of all charitable societies which administer material relief that they revise and study carefully the money standards of income which they are providing for their families." Each social worker should have a general knowledge of food values and should advise with a trained dietitian on problems of the food budget for the families.

**Cost of living in the District of Columbia. [I-V]** (*Mo. Rev., U. S. Bur. Labor Statis., 5 (1917), Nos. 4, pp. 1-17; 5, pp. 1-12; 6, pp. 1-18; 6 (1918), Nos. 1, pp. 1-12; 2, pp. 1-12*).—This is a series of reports of the findings of the special agents of the Bureau of Labor as to the cost of living of wage earners in the District of Columbia.

In the initial report, a summary view of family incomes in the District is given. It is shown that a large proportion of families, both white and colored, in Washington receive incomes of \$900 to \$1,000, which are held to be inadequate to maintain a normal family in comfort.

The second report presents a summary of family expenditures. The fact that a very large proportion of the low-income families of Washington are not spending enough money upon food to maintain the family members in good health is brought out. Family expenditures for food, clothing, housing, sickness, amusement and recreation, insurance, car fare, and other incidentals are also discussed.

In the third report, dealing with the feeding of the family, a special dietary study made by the Bureau of Labor in cooperation with the Office of Home Economics of the U. S. Department of Agriculture is reported, which records the dietaries of 81 families. These dietaries are analyzed and comments made on those of selected families. The conclusion is reached that 30 cts. per day is the least sum upon which an adult male could be properly fed in 1917 at the prices then prevailing. It is further pointed out that this sum is extremely low, and that even when no allowance is made for waste and ignorance a very large number of families covered by the investigation fall below the "minimum of subsistence" line and many far below.

The fourth report deals with wage-earning women, who they are and what they do. A general consideration of the personal and working conditions of 600 wage-earning women is presented.

In the fifth report, dealing with wage-earning women and their clothing, it is pointed out that of 600 wage-earning women of Washington studied 82 per cent spent less than \$150 per year for clothing, 93.5 per cent less than \$200, and only 6.5 per cent as much as \$200.

**Food supply of Jamaica in relation to the great war,** H. H. COUSINS (*Ann. Exp. Dept. Agr. Jamaica, 1917, pp. 1-6*).—The fact that Jamaica is well adapted for the production of a variety of foodstuffs and can obtain very large yields per acre is emphasized. An increased production of the native foodstuffs for 1917 was predicted. That the people are quite largely dependent upon imported fish, bread, and dairy products is also brought out.

**[Public dining room service].**—Five per cent of population eat in public dining rooms (*Hotel Mo., 26 (1918), No. 300, p. 55*).—The estimate is made that the hotels, restaurants, and dining cars of the United States feed approxi-



mately 8 per cent of the population; and that hotels, restaurants, lunch rooms, and cafeterias of the large cities feed approximately 5 per cent of the population.

Suggestions sent to the State institutions of California for food conservation in accordance with the proclamation of the United States Food Administration, M. E. JAYVA (*Cal. Bd. Health Mo. Bul.*, 13 (1918), No. 2, pp. 417-422).—Suggestions are given for conserving food in hospitals, prisons, reform schools, and homes for the feeble-minded according to the suggestions of the U. S. Food Administration. The suggestions are arranged according to food classifications, and include how to conserve meats, flours and meals, bread, breakfast foods, pastes, sugar, butter, and fats.

How to use left-overs ([*New York*): *Mayor Mitchell's Committee on Food Supply*, 1915, pp. 32).—Suggestions and recipes for the utilization of left-over foods are given.

The effect of omnivorous and vegetarian diets on reproduction in the albino rat, J. R. SLONAKER and T. A. CARD (*Science*, n. ser., 47 (1918), No. 1209, pp. 223, 224).—Results are given of an experiment now in its fifth year to show the effect of a vegetarian diet as compared with an omnivorous diet on reproduction in the albino rat. The general conclusion reached is that a vegetarian diet not only reduces the vitality, the growth, and the ability to reproduce, but tends to the extermination of the race.

### ANIMAL PRODUCTION.

[Velvet beans compared with cottonseed meal, corn, and dried blood for live stock] (*Alabama Col. Sta. Bul.* 198 (1917), pp. 103-122).—In this continuation of work previously noted (*E. S. R.*, 36, p. 563), three experiments are reported.

I. *Velvet beans compared with cottonseed meal for fattening steers*, by G. S. Templeton and E. Gibbens (pp. 103-109).—In this experiment, carried out in the winter of 1916-17, the steers were of different quality and the velvet beans were prepared in another way from the previous year. The animals averaged 773 lbs. in weight at the beginning of the experiment which lasted 137 days. They were in lots of 15 each. The beans were fed in the pod mixed with the silage. After four weeks they were soaked in water 12 hours before feeding. The local prices of the feeds were, cottonseed meal \$38, velvet beans in pod \$20, and corn silage \$3 per ton.

The lot of steers on velvet beans in pod and corn silage for 119 days gained an average of 1.6 lbs. each daily at a cost of 9.3 cts. per pound of gain, and the lot on cottonseed meal and corn silage gained an average of 1.55 lbs. each daily at a cost of 10.42 cts. per pound of gain.

The steers cost 6 cts. per pound when put on feed, and the velvet bean lot was sold at 9.75 cts. per pound, netting a profit of \$19.62 each. The cottonseed meal lot sold for 9.4 cts. per pound and returned a profit of \$16.39 each.

In this experiment 1 lb. of cottonseed meal was equal to 2.05 lbs. of velvet beans in pod. The velvet bean lot, however, consumed only two-thirds the amount of silage as the cottonseed meal lot. The velvet bean ration was relished by the animals.

II. *Velvet beans v. cottonseed meal as feeds for dairy cattle*, by G. S. Templeton and H. C. Ferguson (pp. 110-117).—The object of the experiment was to determine the value of velvet beans in the production of milk and milk fat and the relative cost compared with cottonseed meal. Two lots of five cows

each were fed for 28 days and after 7 days reversed and fed for 28 days more. One lot was fed a mixture of corn meal and cottonseed meal, 7:8, with corn silage, and the other lot velvet beans in pod, ground, and corn silage.

More milk and milk fat were produced on the corn meal-cottonseed meal ration, but the cost was lower on the velvet bean ration.

In a second experiment two lots of four cows each were fed for the same periods as in the preceding. One lot was fed corn meal and cottonseed meal, 1:3, with corn silage, and the other corn meal and velvet beans and pod meal, 1:6, with corn silage. As in the previous experiment, more milk and milk fat were produced on the cottonseed meal ration, but on the velvet bean meal ration the cost was lower. With cottonseed meal at \$40 per ton the velvet beans were worth \$15.80 per ton for milk and \$15.92 for milk-fat production. (One lb. of cottonseed meal was equal, in feeding value and economy to 2.5 lbs. of velvet beans in the pod.)

The velvet beans were not palatable to all the cows. The consumption varied between 11 and nearly 4 lbs. daily per animal. The milk flow and the maintenance of body weight of individual cows on the velvet bean rations varied with the amount each consumed.

III. *Velvet bean pasture compared with corn and dried blood; velvet bean meal compared with corn for fattening hogs*, by G. S. Templeton (pp. 118-122).—The farmers of Alabama are using the velvet bean in two ways with hogs. The more common method is to gather the corn after frost has killed the velvet bean vines growing over it and then turn the pigs in the field. The other method is to gather the ripe beans and feed as a concentrate.

An experiment was made with three lots of pigs of five each with corn and dried blood, 10:1, as concentrates. Lot 1 was fed a full ration alone, lot 2 a half ration (2 lbs. to each 100 lbs. live weight) with the pigs on velvet bean pasture, and lot 3 a one-fourth ration (1 lb. to 100 lbs. live weight) on velvet bean pasture.

Valuing the corn at \$1 per bushel, the dried blood at \$60 per ton, and the velvet bean pasture at \$2.83 per acre, it cost \$6.59 to produce 100 lbs. increase in lot 1, \$4.91 in lot 2, and \$4.02 in lot 3.

In another experiment lot 1 was fed corn meal and lot 2 corn meal and velvet bean meal without the pods, 1:1. It took 483.57 lbs. of the corn meal to produce 100 lbs. gain and 537.64 lbs. of the mixture. Valuing the corn at \$1 per bushel and the velvet beans at \$34 per ton, it cost 8.64 cts. per pound of gain with the corn meal and 9.37 cts. with the mixture.

The melting point of the lard from the corn-fed lot was 46.04° C. and from the corn meal-velvet bean meal lot 44.35°. The carcasses of the latter were slightly darker. All carcasses were firm.

Palm-kernel cake, palm-kernel meal, and coconut cake, compared with soy cake, for fattening cattle, young store cattle, and fattening sheep, 1915-16, D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 25* [1917], pp. 51).—During the years 1912 and 1913 Germany imported an average of 248,000 tons palm kernels, 109,000 tons copra, 445,000 tons linseed and linseed meal, 217,000 tons cotton seed, 125,000 tons soy beans, and 84,000 tons peanuts. Large quantities of these are now diverted to England and the experiments here reported were made to determine the best utilization of the resulting by-products.

Four lots of three bullocks and four of three heifers each were used in the trials with fattening cattle. Lot 1 was fed daily a standard ration per 1,000 lbs. live weight made up of 78 lbs. swedes, 14 lbs. seeds hay, 2.25 lbs. soy cake, and 4 lbs. Egyptian cotton cake. In lot 2 the cotton cake was replaced with

4 lbs. palm-kernel cake, in lot 3 with 4 lbs. palm-kernel meal, and in lot 4 with 4 lbs. coconut cake. During the third and fourth months 1 lb. of these four cakes in the four rations was replaced with 0.25 lb. soy cake and 0.5 lb. maize meal to make the rations more palatable. The bullocks during the four months made average gains each per week as follows: Lot 1, 16.5; lot 2, 12.44; lot 3, 14.19; and lot 4, 15.7 lbs. The average profits per head for the four months were for lot 1, £4 5s. 4d. (\$20.77); lot 2, £3 2s. 4d.; lot 3, £5 10s. 7d.; and lot 4, £3 10s. 3d., respectively. The heifers gained 8.92, 10, 9.25, and 7.42 lbs. each per week, respectively. The profits were for the entire period per head as follows: Lot 1, £2 14s.; lot 2, £3 4s. 1d.; lot 3, £2 19s. 5d.; and lot 4, £2 9s. 7d., respectively.

In the experiment with store (stocker) cattle just over six months old three lots of 11, 5, and 3 head, respectively, were used. Lot 1 was fed a daily ration per 500 lbs. live weight of 10.5 lbs. seeds hay, 0.5 lb. soy cake, and 2.5 lbs. palm-kernel cake; lot 2, 10.2 lbs. seeds hay, 0.5 lb. soy cake, and 2.5 lbs. palm-kernel meal; lot 3, 25 lbs. swedes, 6 lbs. seeds hay, 1 lb. soy cake, and 2 lbs. palm-kernel cake. The average weekly gains per head were for lot 1, 7.44 lbs.; lot 2, 9.5 lbs.; and lot 3, 11.06 lbs. The profits per head for the 16 weeks of the experiment were for lot 1, 10s.; lot 2, £1 3s. 3d.; and lot 3, 10s. 1d. Lots 1 and 2 were wintered outside and lot 3 inside. Lot 3 made better average gains, but the lots wintered outside were in better feeding condition and valued higher in the spring.

The sheep were divided into three lots of 16 each and fed the following rations daily per 100 lbs. live weight: Lot 2, 8 lbs. swedes, 1.5 lbs. seeds hay, 0.4 lb. soy cake, 0.4 lb. Egyptian cotton cake, and 0.25 lb. maize meal; lot 2, 7.2 lbs. swedes, 1.2 lbs. seeds hay, 0.4 lb. soy cake, and 0.5 lb. palm-kernel cake; and lot 3, 8 lbs. swedes, 1.2 lbs. seeds hay, 0.4 lb. soy cake, and 0.5 lb. palm-kernel meal. Those with cotton cake in the ration gained an average of 1.52 lbs. per week, with palm-kernel cake 1.8, and with palm-kernel meal 1.89. The gains above expenses for the three months of the trial were for the three lots 3s.; 4s. 6d.; and 5s. per head, respectively.

Palm-kernel meal containing less than 2 per cent of oil gave better results with all the animals than palm-nut cake containing nearly 6 per cent. The meal and cakes were stored in a granary and kept in good condition for some months. No difficulty was encountered in getting the animals to eat them. The composition of the cakes and meal used in the experiments is shown.

Analyses, by S. H. Collins, of the feeds used are given.

The question of silage and its fermentation, E. PERBONCITO (*Ann. R. Accad. Agr. Torino*, 58 (1915), pp. 219, 220).—Preliminary work with the organisms concerned in fermenting silage is outlined.

Commercial feeding stuffs, 1916-17, C. D. WOODS ET AL. (*Maine Sta. Off. Insp.* 84 (1917), pp. 53-120).—Tabulated data are given as to the registration and the general results of the examination of about 700 samples of feeding stuffs.

Live stock in Colorado, with special reference to beef cattle and sheep. C. I. BRAY (*Denver: Colo. Bd. Immigr.*, [1917], pp. 18 figs. 2).—The live-stock industry in Colorado is described and information of value to newcomers to the State is detailed.

Cattle rearing, W. BRUCE (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 14 (1916), pp. 164-180).—Attention is called to the great change in the Scottish cattle industry whereby cattle rearing has been replaced by cattle feeding as the more general practice. This article is timely because of the scarcity

of feeders, and seeks to bring out the methods of producing good commercial cattle rather than pure-bred breeding stock. In the former case the animals must be grown on the minimum amount of economical feeds and must recoup from a narrow range of prices compared with the possibilities of breeding cattle.

*The natural system.*—Where there is a scarcity of housing but sheltered fields and second- or third-rate grass, animals may be kept out all winter living on what they gather, supplemented with a little second-rate hay or a few turnips fed on the grass. Cattle that lend themselves to this method of wintering are Galloway and West Highland breeds. The slowness in maturity of their offspring may be somewhat overcome by breeding them to the Shorthorn, this breed having proved from experience best for using on these hardy out-wintered cows.

The best calving time for these cows is early in April. The animals should be tied up for a week or two at this time so that they may be better attended to and gentled. The calves should be weaned, put on extra feed, and housed by the beginning of October. Both dams and calves can then be put into good condition for the winter. The cost of raising cattle by this method varies chiefly with the value of the grazing.

A second method of rearing cattle employs housing, thus permitting the use of the better and earlier maturing, though less hardy, beef breeds. Describing the method as carried out at Camperdown the cows calve in February, except the heifers which, for their further development, are allowed to go till April. The cows are fed on turnips and oat straw until they go on grass in May, while the calves are allowed access to the same feed as early as they desire. The calves are weaned in October and put on a ration of turnips and straw and 1 lb. of cake and 1 lb. of dried grain daily. The concentrated ration is increased gradually to 3 lbs. per head after midwinter. At the commencement of the grazing season the following spring the cake is increased to from 5 to 6 lbs. daily. The calves are later brought into the yards and finished off with turnips, straw, hay, and at the end 8 lbs. of concentrated feeds. They are sold to the butcher between November and the middle of January, weighing from 10 to 13 cwt. at from 21 to 22 months of age. After the calves are weaned in October the cows are grazed until the middle of December and then housed in the cattle yards, where, except for an occasional airing on a good day, they pass the winter on turnips and oat straw.

The author describes methods whereby two, four, and even five calves are suckled by one cow during a season. In this system the cows must be good milkers and the pasture abundant. The cows must be watched closely and additional food beyond grass, turnips, and straw given when the conditions demand.

After the calf is born it is rubbed dry and a bought-in calf tied with it behind the cow and both allowed to suckle three or four times daily. After a few weeks all are turned out together. At the end of June or the beginning of July the calves are taught to eat linseed cake and bruised oats and weaned, the cow tied up, and two young calves put to suckle her. These are weaned late in the year and in some cases one more calf put upon the cow.

*The artificial system.*—Three lines of hand feeding calves are generally followed: First, the young calf is fed mostly whole milk for three or four months, and in the meantime taught to consume other feeds. Second, it is fed skim milk, with some substitute for the butter fat removed. Third, when milk is very dear, the calves are fed substitutes after the first week or two.

A number of experiments made in Scotland and Ireland are cited and discussed. The author describes one in which he reared calves on 100 gal. of whole milk each, which with a good cow means about eight calves, using calf meal, cake, and grain as supplements. The scheme as carried out was as follows:

Beginning the first week the calf was given 8 gal. of milk, which was increased to 10.5 gal. from the second to the fourth and then gradually decreased to 1.75 gal. the sixteenth week. Beginning the fourth week the calf was fed 10 pints of gruel, which was gradually increased to 42 pints the twelfth week and reduced to 28 pints by the sixteenth. At the seventh week 1.75 lbs. of calf meal was fed, which was gradually increased to 7 lbs. weekly at the sixteenth. Good hay was given after four weeks, and turnips and grass when the calves would take them. The calf up to 18 weeks consumed 100 gal. of milk, 47 gal. of gruel, and 88 lbs. of calf meal.

The calf meal was made up of linseed meal, crushed linseed, wheat parings, and locust-bean meal, 4:2:1:1. The gruel was made of from 2 to 3 lbs. of calf meal made into a paste with 1 qt. of cold water, to which was added 1 gal. of boiling water and fed at blood heat.

[Prickly pear for cattle], F. SMITH (*Queensland Agr. Jour.*, n. ser., 6 (1916, Nos. 4, pp. 239-244; 5, pp. 304-307).—This is the first and second progress report of work on this subject at the prickly-pear feeding station at Wallumbilla.

In studying the comparative values of scrub and forest pear in stock feeding no essential difference was found by analyses. That the animals selected one in preference to another seemed due to the number and condition of the spines borne and not to any difference in flavor or palatability.

In maintenance feeding prickly-pear feeding alone does not suffice but is more efficient with a medium amount of nonnitrogenous roughage. Pear with small amounts of nitrogenous concentrates or leguminous hay conserves weight and permits small gains. With supplementary feeds the animals will eat more of the pear than when on a feed of it alone. The amount of pear consumed depends largely upon the individuality of the animal. In minimum amounts nitrogenous feeds added to the ration will cause a longer consumption of pear than nonnitrogenous. Too large a use of supplementary feeds will cause a lessened consumption of pear.

Slicing pear to make it acceptable to the animals is preferred to singeing. Under the methods employed at the station one man can handle and distribute pear for from 50 to 60 head of cattle per day. In five months of feeding no animal showed any trouble from eating pear prepared in this way. Scouring was not pronounced except in cases where pear was fed alone or in amounts in the ration of over 90 lbs. daily.

Future work in feeding pear is outlined. See also the articles previously noted (*E. S. R.*, 38, pp. 571, 572).

Wool price calculator (*Canada Dept. Agr., Live Stock Branch Pamphlet 13* (1916), pp. 71).—A calculating device is described.

Age affects rate and economy of gains in hogs (*Mo. Bul. Ohio Sta.*, 3 (1918), No. 1, p. 29).—In the first experiment the pigs, shortly after weaning time, were placed on a ration of corn, middlings, and tankage (10:4:1), and in the second a ration of corn and tankage was fed. The corn and tankage was fed in the proportion of 8:1 at first, the corn being increased one-fourth part weekly for 24 weeks, after which the ratio remained constant.

The following table shows by 100-lb. intervals the average results of the two experiments:

*Effect of age on rate and economy of gains in pigs.*

Weight of pigs.	Number of pigs.	Average daily gain.	Average time required.	Feed per pound of gain.
		Pounds.	Days.	Pounds.
up to 100 lbs.....	25	0.705	152.72	3.18
100 to 200 lbs.....	20	1.145	87.05	3.62
200 to 300 lbs.....	15	1.120	88.33	4.35
300 to 400 lbs.....	10	1.816	53.2	4.50
400 to 500 lbs.....	5	1.694	60.8	4.97

The breaking of unruly horses, especially those from America, DARRAS in *Agr. et Rurale*, 7 (1917), No. 14, pp. 239-242, figs. 3).—Many horses imported into France for war purposes are not properly broken and some are so vicious that they are of little or no use. A method is described for breaking such horses quickly and using them in various branches of the service. For this work a specially constructed box or stall is used which confines the animal and allows handling by the trainer without the necessity of employing undue force or brutality. The stall is figured and described in detail.

The practical utilization of the light horse, P. DUFFLOTH (*Vie Agr. et Rurale*, 7 (1917), No. 14, pp. 235-235, figs. 4).—The adaptability and value of the small horse in modern warfare are discussed.

How to select laying hens, O. B. KENT (*N. Y. State Col. Agr., Cornell Univ. Ext. Bul.* 21 (1917), pp. 23-33, pls. 5, figs. 9).—The author points out indications of laying condition in hens as shown by changes in fat, color, body shape, secondary sexual characters, plumage, and actions. Directions are given for culling flocks of hens on this basis.

Wing molt as an indication of production, O. B. KENT (*Cornell Countryman*, 15 (1918), No. 4, pp. 192, 193, 212, figs. 3).—A method is described of determining quite accurately by the primary wing feathers how long a fowl has been in molt. It has been found that the time that a fowl stops laying in the fall is closely related to her total egg production, and that a hen, especially a Leghorn, usually stops laying when she begins molting. The time of onset of molting thus furnishes a means for determining how many eggs a bird has laid.

Value of breeding from selected stock, H. M. LAMON (*Jour. Mass. Poultry Soc.*, 1 (1917), Nos. 2, pp. 15, 16; 3, p. 24; 4, pp. 30-32).—This is a discussion of the selection of poultry for vigor and vitality and the value of breeding from selected stock. The author recommends that in breeding work (1) a detailed description of matings be kept, (2) every hen trap nested and every chick toe punched, banded, or marked in some way, (3) 2 or 3-year old hens used to breed from, as these lay larger eggs than pullets, and (4) chicks hatched in March and April. He maintains that healthy fowls and good incubation, brooding, feeding, and range are necessary for the successful production of high-class stock.

A fowl's breeding value, W. A. LIPPINCOTT (*Country Gent.*, 82 (1917), No. 2, pp. 10, 11, figs. 8).—In a flock of a breed of chickens, some of whose distinguishing characteristics are dominant, there is always a chance that some such character as rose comb or silver or black color may be carried in an impure or heterozygous condition. The author outlines the method of testing indivi-

dual fowls for the purpose of discarding those heterozygous for the character in question.

**Poultry culture** (*Mass. Bd. Agr. Bul. 1, 5. ed. rev. (1917), pp. 159, pls. 14, figs. 6*).—This is the fifth edition, revised, of this treatise on the different phases of poultry culture in Massachusetts. A bibliography is appended and the bulletin indexed.

**Poultry raising in Colorado**, W. E. VAPLON ET AL. (*Denver, Colo.: State Bd. Immigr., [1917], pp. 16, fig. 1*).—A series of articles on poultry raising written by men of practical experience in the State for the information of prospective settlers.

**Pets: Their history and care**, L. S. CRANDALL (*New York: Henry Holt and Co., 1917, pp. XII+372, pls. 32*).—This work, which closely follows the title, was written by the assistant curator of birds, New York Zoological Park. It treats of mammals, birds, reptiles, and fishes that are or may be reared as pets.

**Color inheritance in mammals**.—II-V, S. WRIGHT (*Jour. Heredity, 8 (1917), Nos. 8, pp. 373-378; 9, pp. 426-430; 10, pp. 473-475, 476-480*).—Four papers are presented.

II. *The mouse*.—In this paper a detailed analysis is given of the present state of knowledge of color inheritance in the mouse. A list is given of the seven sets of Mendelian allelomorphs that have been identified and of the three series of color variations that so far have been analyzed. These are classified according to their apparent physiological effects under the scheme already noted (*E. S. R., 37, p. 866*).

III. *The rat*.—This digest of data on the inheritance of color in rats consists in the main of an interpretation of the results of Castle's selection experiments with hooded rats (*E. S. R., 27, p. 369*).

The author concludes that genetic variations are occurring sufficiently often to give a basis for selection to an indefinite extent. "Under any interpretation, Castle's selection experiment demonstrates the efficacy of Darwinian selection. It is true that one large mutation occurred with effects perhaps as large by itself as the entire plus selection series, but where such a variation gives a new level selection has produced a continuous series of stable levels. This would give selection of small variations a more important place in evolution and animal husbandry, where it is nice adjustments of one character to another or to the environment that count."

IV. *The rabbit*.—The author lists the ten unit differences known to be involved in the inheritance of color in rabbits. These are classified into seven independent sets of allelomorphs, three of which have been proved to be triple allelomorphs. These three sets of allelomorphs, as in the case of several other mammals, determine linear series of physiological effects not to be explained as linkage of factors in the germ cells.

V. *The guinea pig*.—In this brief discussion it is noted that "coat pattern in guinea pigs, and doubtless other animals as well, must be determined by a complex of causes of very diverse kinds. There are hereditary factors of various sorts and factors which are of the nature of accidents in development. There are factors which affect the extent of pattern and others which determine its localization. Of the latter some relate the pattern to the axis of symmetry and organs of the body, while others are random in their incidence. Some factors affect only the tortoise pattern in one way or another, or only the piebald pattern, while others have a simultaneous influence on both. The result is such a diversity of pattern among tricolors that a rough sketch will identify almost any animal in a stock of a thousand."

## DAIRY FARMING—DAIRYING.

The agricultural situation for 1918.—II. Dairying.—Dairy production should be maintained (*U. S. Dept. Agr., Office Sec. Circ. 85 (1918), pp. 24, fig. 11*).—This article, one of the series prepared by the Department in the effort to increase the food production of the Nation in the present crisis, relates to the importance of proper maintenance of dairy production. The subject is treated under the headings importance of dairying, exports increase and imports decrease, food value of milk not fully appreciated, the dairy cow an economical producer of animal food, some advantages of dairying, how to increase production, economical feeding makes for profits, better utilization of dairy products, the war's effect on the world's supply of dairy cattle, duties of dairymen, and decreased production through reduction of disease.

The relation of size of dairy to economy of milk production, J. A. HOPKINS, 1 (*Delaware Sta. Bul. 118 (1918), pp. 3-50, figs. 2*).—The study here reported was made to determine the correlation between the size of dairies operating under given conditions and their profitableness as indicated by profit per cow per year, cost per quart of milk, and profit per quart. The investigation was conducted during 1916 and involved 87 dairies in northern Delaware and southwestern Pennsylvania. As a method of comparison these dairies were divided according to size into nine classes which varied from dairies of less than 10 cows in class 1 to those of from 75 to 100 cows in class 9. Data for each of the classes are tabulated and discussed in detail.

The following table gives some of the results obtained:

*Effect of size of dairies on cost of milk production.*

Number of cows in dairies.	Number of herds.	Average annual production per cow.	Cost of feed and pasturage per cow.	Cost of labor per cow.	Total expense per cow.	Cost per quart of milk.		Price received per quart of milk.
						Lowest.	Average.	
		Quarts.				Cents.	Cents.	Cents.
Under 10.....	10	2,044	\$82.23	\$27.46	\$109.69	5.8	7.70	5.2
10-14.....	11	1,873	84.48	19.20	103.68	5.6	8.40	4.4
15-19.....	10	2,326	81.39	25.82	107.21	3.9	6.35	4.6
20-24.....	11	2,375	80.88	23.54	104.42	4.6	6.50	5.3
25-29.....	9	2,935	90.20	27.23	117.43	4.0	5.50	5.7
30-34.....	10	2,939	81.78	22.71	104.49	3.4	5.20	4.9
35-39.....	8	2,891	80.35	23.03	103.38	3.6	4.70	4.6
40-44.....	8	3,018	90.81	24.28	115.09	3.8	5.20	5.2
45-100.....	9	3,475	97.57	48.96	146.53	3.7	5.90	7.2

The superior productiveness of larger dairies was found to be caused, in part at least, by the better type of cows which they kept. The cost per cow for hauling milk decreased as the size of the dairy increased up to 40 cows; then increased slightly as the addition of another horse became necessary; then decreased again as the size of the dairy increased. Cost of bull service per cow decreased as size of dairy increased up to 40 cows, then increased slightly as a second bull was added, and increased again as a third bull was added in dairies of over 80 cows. Cost of supervision increased slightly with the size of dairy. However, this added expense was more than offset by greater intelligence of management. The larger dairies produced a higher grade of product than the smaller ones and disposed of it at a higher and better price.

The management of dairy herds, E. V. ELLINGTON (*Idaho Sta. Bul. 102 (1917), pp. 3-40, pl. 1*).—This bulletin is a general discussion of the oppor-



tunities for dairying in Idaho, the breeds of dairy cattle, community breeding, selection and management of the herd bull, feeding dairy cattle, silos and silage, other feeding stuffs, calf raising, dairy barns, and milking machines.

The cost of milk production in Massachusetts, W. H. BRONSON (*Mass. Agr. Col. Ext. Serv. Bul. 19 (1918), pp. 20, fig. 1*).—The records used in estimating the cost of milk production in Massachusetts are for the year ended April 30, 1917, and are based upon data obtained from 87 herds distributed in 10 counties in that State. The following results are shown:

*Cost of milk production in Massachusetts with different grades of cows.*

Items of cost.	Average for all grades.	Less than 5,501 lbs.	5,501 to 7,500 lbs.	More than 7,500 lbs.
Feed.....	\$109.82	\$100.45	\$109.12	\$129.11
Labor.....	53.10	42.06	50.41	69.38
Other costs.....	38.44	29.61	36.30	52.11
Total cost per cow.....	201.36	172.12	195.83	250.60
Net cost per cow.....	185.31	156.88	182.86	211.54
Net cost per quart.....	.0618	.0721	.0624	.0652

Dairying in Uruguay, A. ABELLA (*Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 5, pp. 629-637*).—This is a discussion of the dairy industry in Uruguay, including statistics of dairy cattle, milk consumption and price, and imports of dairy products, and an epitome of legislative measures for the sanitary control of milk supply of cities in Uruguay.

Experiments with artificial one-year pastures, A. V. DAVYDENKO (*Russko-Nakhichivan. na Donu Selsk. Khoz. Opytn. Sta. Bül. 102 (1916), pp. 84*).—Experiments carried on in 1911, 1914, and 1915 with milch cows on one-year pasture crops are reported. The aim was to investigate the nutritive value and digestibility of rye-cowpeas mixture, oats-cowpeas mixture, and early sorghum, and the influence of these mixtures on the production and composition of milk. The green fodder mixtures were fed to one lot of cows each on pasture and in the stable. As a control one lot of cows was fed in the stable and on dry lot a ration of bran and straw, hay, and silage.

The coefficients of digestibility of the fodder mixtures are given in the following table:

*Coefficients of digestibility of green fodder mixtures.*

Kind of fodder.	Dry matter.	Organic matter.	Protein.	Fat.	Cellulose.	Nitrogen-free extract.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Rye-cowpeas mixture.....	70.27	73.28	70.24	79.66	74.28	75.60
Oats-cowpeas mixture.....	66.76	69.23	69.23	69.06	58.13	72.43
Sorghum.....	67.02	70.29	64.43	78.53	66.41	72.79

The results obtained in 1915 indicated that the green fodder mixtures had no specific effect on the quantity or quality of the milk. The pasture mixtures furnished the cows sufficient nutritive substances for their needs. On green fodder the cows gave more milk and fat on pasture than in the stable. This increased productivity of the cows on pasture may be explained by a greater amount of nutritive substances obtained in the fodder brought about by an increase of appetite as a result of exercise in the open. The pasture mixtures

and no bad effect on the general condition of the cows, nor was there any perceptible decrease in their live weight.

**Mineral metabolism of the milch cow, E. B. FORBES** (*Mo. Bul. Ohio Sta.*, (1918), No. 1, pp. 8-10).—A brief report is made of results secured in the third experiment of this series of studies (*E. S. R.*, 37, p. 1639), together with suggestions to dairy farmers upon the importance of legumes in feeding for heavy milk production.

The rations used in this experiment consisted of alfalfa as a sole roughage, with corn, cottonseed meal, linseed meal, and wheat bran. In certain periods the rations were supplemented by large amounts of calcium lactate, calcium chlorid, and precipitated bone flour. The cows almost invariably gave off more calcium, magnesium, and phosphorus in milk and excreta than was consumed in the feed. It was impossible by any of the means employed to prevent entirely this loss of minerals.

Results of investigations upon the causes of the limited capacities of cows to utilize mineral nutrients indicate that this was not due to lack of proper proportion among these nutrients, nor to deficiency of common salt, from which is formed the hydrochloric acid of the gastric juice, nor to difficult solubility of the supplements used, since even the water-soluble calcium lactate and calcium chlorid were poorly utilized. The limiting factor, it is thought, is in the process of assimilation of the mineral nutrients by the bones.

It is true that most of the losses of minerals observed were small in comparison with the extent of the cow's mineral stores; and that these overdrafts would doubtless be repaid later in the period of lactation when the milk flow, and therefore the draft upon the mineral reserves of the skeleton would have become sufficiently reduced, provided the conditions of feeding were favorable. Still the facts as demonstrated are considered to be practically significant in relation to the frequent failure of heavy-milking cows to breed, to the shrinkage of milk production coincident with advance in the period of lactation, and to malnutrition of the bones.

Among other facts of general significance which were observed was the lack of a close relation between the nitrogen of the body and the minerals of the bones in their metabolism. Bone starvation may proceed for some time before it seriously affects the gross body metabolism. In general it appears that the character of the body metabolism is highly variable; the organism does not gain and lose in each of its constituents at proportional rates, but rather it exhibits a remarkable degree of metabolic adaptability."

**Simple problems concerning the fat secretion of milk glands, H. ISAACHSEN** (*Norsk Vet. Tidsskr.*, 29 (1917), No. 6, pp. 165-178, figs. 7).—In experiments here reported, involving four cows, one cow was slaughtered before milking, another after milk had been abstracted by means of a catheter, the third after having been partly milked, and the fourth after having been milked dry. Samples of the milk glands were taken immediately after slaughtering for microscopic examination. In the living cows part of the milk gland was removed by harpooning.

Microscopic examination showed that the milk glands from cows that were not milked or which had only been tapped for samples contained large, extended alveoli and alveolar ducts. The epithelial cells were full of fat drops. In samples of milk glands from cows that were milked dry, showing many smaller alveoli, the alveolar ducts were much broader and there were no fat drops in the epithelial cells. Milk glands from cows milked half dry showed smaller alveoli, and the fat content of the epithelial cells was less than of those from cows which had not been milked.

The results indicate that the stimulation necessary for normal milk secretion is of varied origin, and that the irritation produced by the hand and by the calf's sucking causes a change in the composition of the milk. Hand milking appears to be more stimulating to milk secretion than machine milking. It is noted that the leucocytes increase in the milk during milking.

Gradual conversion of colostrum into normal milk (*Österr. Molk. Ztg.*, 24 (1917), No. 14, p. 129; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 10, pp. 1378, 1379).—A series of analyses of the colostrum of milch cows was made at the Station for Milk Control at Memmingen, Bavaria, during 1910. Some of the results of these analyses are given in the following table:

Results of analyses of colostrum.

Age of colostrum.	Sp. gr. at 15° C.	Fat content.	Dry matter.	Solids-not-fat.	Acidity (H <sub>2</sub> SO <sub>4</sub> ).	Refractive index.
Days.		Per cent.	Per cent.	Per cent.		
1.....	1.0745	5.60	25.60	20.00	12.80	.....
1.....	1.0302	3.80	14.82	10.82	9.20	.....
1.....	1.0350	4.20	14.05	9.85	11.20	29.2
2.....	1.0341	3.70	13.22	9.52	10.00	29.2
3.....	1.0333	3.60	12.90	9.30	9.20	29.0
4.....	1.0323	3.60	12.65	9.05	8.40	29.3
5.....	1.0321	3.80	12.84	9.04	8.40	29.2
6.....	1.0321	3.65	12.66	9.01	8.20	29.2
7.....	1.0312	3.70	12.50	8.80	8.00	29.4
8.....	1.0316	3.63	12.51	8.88	8.00	29.4
9.....	1.0329	3.73	12.95	9.22	8.00	29.4
10.....	1.0316	3.70	12.80	8.90	7.20	29.7
11.....	1.0322	3.58	12.60	9.02	7.20	29.1

The results indicate that, while milk may become practically normal as early as the fifth day, the acidity only becomes normal on the tenth. The relation between casein and albumin and the results of fermentation experiments indicate that the milk is not capable of caseification before the tenth day. Until the fourteenth day milk that is not fresh adheres to cooking vessels and acquires a burnt flavor.

The analysis of milk secreted by a suckling doe kid, R. L. HILL (*Jour. Biol. Chem.*, 33 (1918), No. 3, pp. 391-393).—The author, at the Maryland Experiment Station, reports chemical analyses of milk secreted spontaneously by a 4-months-old virgin doe kid.

The milk had the characteristics, properties, and chemical composition of the milk secreted by the kid's mother and other goats. Since no colostrum was secreted, the inference is that the "secretion of colostrum is associated with and possibly is produced by the cessation of pregnancy, and may not occur in lactation not associated with pregnancy."

Report of the Mayor's Committee on Milk, City of New York, 1917. C. E. NORTH (*Town [Baltimore]*, 3 (1918), No. 19, *Sup.*, pp. 2-6).—This article contains extracts from the report of the committee on milk. The conclusions from the report are as follows:

"(1) Milk is the most valuable and the cheapest of human foods, even at present prices. (2) For drinking purposes New York City now uses only about 700,000 qts. daily. The city should use about 2,000,000 qts. daily for drinking in an ideal diet. (3) The cost of milk production at present prices is 7 cts per quart, and the prices asked by the Dairymen's League are justified. (4) The cost of distribution, as shown by the dealers' accounts, is justified, and not large enough to prevent business losses. (5) The cost of production can

be reduced by (a) eliminating low-producing cows, (b) collective hauling of milk, (c) collective buying of grain. (6) The cost of distribution can be reduced by abolishing competition and duplication through centralizing the distributing system into a single company or public-service corporation."

**Inspection and sanitation of dairies.** J. O. LABACH and N. M. CREGOR (*Kentucky Sta. Bul. 211 (1917), pp. 211-228*).—The first part of this bulletin contains notes on the inspection and sanitation of dairies and a reprint of the report of the committee on rules and regulations of the International Association of Dairy and Milk Inspectors on standards necessary for securing a clean and safe milk supply. Part 2, by N. M. Cregor, outlines the scope and use of the dairy score card and gives tabulated results of inspection of the dairies of the State.

**Dairy Bacteriology.—I, Bacteriology of milk.** W. STEVENSON (*Trans. Highland and Agr. Soc. Scot., 5. ser., 29 (1917), pp. 153-181*).—This article treats in a popular way of the bacteriology of milk and briefly describes a few of the more common species of each of the main groups of bacteria ordinarily found in milk, indicating the main characteristics of each, the effects produced, and the usual sources of infection. Simple directions are given for the control of bacterial growth in milk and for dealing with faults in milk.

**Investigation of conditions affecting the content of water in butter, with the use of various types of churns.** L. F. ROSENGREEN (*K. Landtbr. Akad. Handl. och Tidskr., 55 (1916), No. 4, pp. 249-263*).—This is a comparison of various types of churns and of the influence of salt on the water content of butter.

It is noted that if the water content is too large the butter must be reworked. Reworking decreases the water content of salted butter, but not of sweet unsalted butter. The working of butter without washing reduces the percentage of water. Washing decreases the water content of sweet cream butter, but it does not change the water content of sour cream butter.

**Varieties of cheese: Descriptions and analyses.** C. F. DOANE and H. W. LAWSON (*U. S. Dept. Agr. Bul. 608 (1918), pp. 80*).—This is a revision of a bulletin previously noted (*E. S. R., 27, p. 75*). A few additional varieties of cheese have been included, and notes are given on the manufacture of domestic varieties of European cheese in the United States.

## VETERINARY MEDICINE.

[Live stock diseases], G. C. HUMPHREY (*In The Rural Efficiency Guide.—IV. Stock Book. Cleveland, Ohio: The Peoples Efficiency Publishing Co., 1918, pp. 62-100, 139-181, 200-212, 234-272, 328-355, 376-380, 394, 402, figs. 52*).—In this volume the diseases of cattle (pp. 62-100), of horses (pp. 139-181), of sheep (pp. 200-212), of swine (pp. 234-272), and of poultry (pp. 328-355, 376-380, 394, 402), are dealt with.

A practical textbook of infection, immunity, and specific therapy, with special reference to immunologic technique, J. A. KOLMER (*Philadelphia and London: W. B. Saunders Co., 1917, 2. ed. rev., pp. XIII+978, pls. 35, figs. 164*).—A thoroughly revised edition of the work previously noted (*E. S. R., 22, p. 476*).

**Veterinary surgical operations.** L. A. MERRILL (*Chicago: Alexander Eger, 1918, 2. ed., rev. and enl., pp. 556, pls. 4, figs. 281*).—A textbook for the student and practitioner of veterinary medicine.

**Report of the bureau of animal industry [New Jersey], J. H. MCNEIL (*N. J. Dept. Agr. Bul. 9 (1917), pp. 308-311*).—A brief report on the occurrence of and work with the more important infectious diseases of the year.**

Veterinary division, annual report, 1915-16, C. E. GRAY (*Union So. Africa Dept. Agr. Rpt. 1916*, pp. 27-38).—The usual report of the occurrence of and work with the more important infectious diseases of live stock during the year.

The chemical investigation of some poisonous plants in the natural order Solanaceae.—III, The occurrence of nor-hyoscyamine in *Solandra longiflora*, J. M. PETRIE (*Proc. Linn. Soc. N. S. Wales*, 41 (1917), No. 164, pp. 815-822).—The leaves of *S. longiflora* were found to contain nor-hyoscyamine as the chief alkaloid, this alkaloid having been isolated and described by the author in 1907 under the name "solandrine." *Solandra* also contains hyoscyamine in lesser amount, but scopalamines are absent. The total amount of alkaloid obtained was 0.17 per cent in the leaves (dried at 100° C.).

A discussion of some principles of anthelmintic medication, M. C. HALL (*New Orleans Med. and Surg. Jour.*, 70 (1918), No. 8, pp. 637-653).—A general discussion of this subject.

Some new antiseptics and disinfectants, N. S. MAYO (*Amer. Jour. Vet. Med.*, 13 (1918), No. 3, pp. 111-115).—Dakin's solution, chlorazene, and dichloramin-T are considered as to composition, preparation, use, and applications in veterinary surgery and practice. Cases are reported of the successful use of chlorazene for intravenous injections in cases of septicemia and contagious abortion, and of dichloramin-T in the treatment of fistulous withers.

"X-acid" as a remedy in polyneuritis and beriberi, D. J. HULSHOFF (*Jour. Physiol.*, 51 (1917), No. 6, pp. 432-439).—An experiment reported by the author indicates that 1 gm. of dry extract, prepared from katjang hidgee (*Phascolus radiatus*) and dissolved in water, suffices to cure polyneuritis gallinarum. "Administration of the dry extract dissolved in a small quantity of water gives better results than administration of the decoction since the disadvantages attached to passing large quantities of fluid into the crop are avoided."

An experimental investigation of lipovaccines, E. B. WHITMORE and E. A. FENNEL (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 13, pp. 902-904).—Continuing the work previously reported (*E. S. R.*, 38, p. 584), the authors report that "the lipovaccines can be made on a large scale by growing the bacteria in Kolle flasks, taking off the growth with a vacuum scraper, freezing and drying in vacuo, and emulsifying in lanolin and oil by grinding in a ball mill using glass bottles and steel balls. The oils can be sterilized by steam at 15 lbs. for 15 minutes, by heating to 90° C. for 10 hours on a water bath, or by mixing with potassium iodid."

The preparation of Dakin's solution and the Carrel technique in the treatment of infected wounds, W. N. McDONELL (*U. S. Naval Med. Bul.*, 12 (1918), No. 1, pp. 45-53, fig. 1).—Details are given of the preparation of this solution which, it is pointed out, may be satisfactorily prepared in several ways.

Studies on the cicatrization of wounds, TUFFIER and DESMARRES (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 5, pp. 230-232).—Observations of various processes for hastening the healing of wounds have led to the following conclusions:

A simple dry, sterile, and absorbent dressing applied to a sterile wound produces a slightly more rapid cicatrization than Dakin's solution. Alternating aseptic dressings following the cycle of sodium hypochlorite, physiological serum, boiled water, and dry dressing, increases only slightly the rate of healing. Heliotherapy associated either with hypochlorite or a dressing of neutral substances, such as zinc oxid or bismuth subgallate, gives excellent results.

Note on an apparatus for counting and identifying the organisms of surface wounds and of the skin, GRAYEZ (*Compt. Rend. Soc. Biol. [Paris]*, 80 (1917), No. 15, pp. 736, 737, figs. 2).—The apparatus consists of a layer of agar

2 mm. thick fastened aseptically on the outer wall of a test tube. The cylinder of nutritive material can be rolled over the wound or skin to be examined and the organisms thus fixed on the surface grown, counted, and identified.

The technique of the preparation of the cylinder is described.

**Ptomaines and war wounds.** A. BERTHELOT (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 4, pp. 187-189).—The author suggests the possibility that the formation of ptomaines in war wounds may be one of the causes of auto-intoxication which aggravates the condition of certain severe wounds. In verifying this hypothesis he has shown by test-tube experiments that toxic ptomaines, particularly imidazoethylamin, may be formed by the action on the blood of proteolytic and decarboxylating organisms present in war wounds.

**The hematoxin of *Bacillus welchii* (*B. perfringens*).** A. OURANOFF (*Compt. Rend. Soc. Biol. [Paris]*, 80 (1917), No. 15, pp. 706-708; *abs. in Chem. Abs.*, 12 (1918), No. 1, pp. 63, 64).—The following conclusions are drawn from a study of several strains of *B. welchii*:

Strains of *B. welchii* isolated from different wound infections have the property of secreting a hematoxin which acts upon the erythrocytes of various animals. The faculty of producing hematoxin is characteristic of the strains of *B. welchii* in different degrees. The same strain can temporarily lose its faculty of producing hematoxin and recover it later. The hematoxin is destroyed by heating for half an hour at 60° C. and by keeping in strong light for several days, but it may be kept for several months at a temperature of 14 to 15° or at a temperature near zero. On filtering through Chamberland or Berkefeld filters a part of the hematoxin remains on the filter.

Phenomena of hemoglobinuria have been observed in rabbits and young dogs which have died following injection of *B. welchii* hematoxin, thus proving the intravital destruction of erythrocytes by this toxin. The serum of the animals studied (man, pig, dog, horse, cow, sheep, guinea pig, rabbit, and chicken) diminishes the action of the hematoxin. Prolonged hyperimmunity in horses by cultures of *B. welchii* increases considerably the action of serum on the hematoxin, showing that the production of antihematoxin becomes more intense under the influence of the introduction of *B. welchii* into the organism. Increase in antihemolytic titer toward the hematoxin of *B. welchii* is not observed in the serum of horses hyperimmunized by the organisms of putrefaction (*B. proteus vulgaris* and *B. sporogenes*). During filtration through Chamberland filters of the serum of normal horses and those hyperimmunized by cultures of *B. welchii*, a large part of the antihematoxin remains on the filter. Cultures of *B. welchii* devoid for various reasons of hemolytic properties often present the phenomena of hemagglutination.

**The developmental cycle of the *Bothriocephalus latus*.** C. JANICKI and F. ROSEN (*Corresp. Bl. Schweiz. Ärzte*, 47 (1917), No. 45, pp. 1505-1516; *abs. in Jour. Amer. Med. Assoc.*, 69 (1917), No. 26, p. 2212).—In work at the laboratories of the universities of Lausanne and Neuchâtel the authors found that the larvae of (*B.*) *Bothriocephalus latus* are ingested by *Cyclops strenuus* and *Diaptomus gracilis*, which are eaten by fish, and thus the parasite finds its way to man, dog, and cat. Each of the five phases of the cycle may take from three to four weeks.

***Wohlfartia magnifica*, a sarcophagid parasitizing man.** L. GOUGH (*Bul. Soc. Ent. Egypte*, 10 (1917), No. 1, pp. 23-25).—The author records the collection of *W. magnifica* from the orbits and from ulcers behind the ears of patients in the ophthalmic hospitals at Sheybeen-el-Koom, Kafr-el-Dawar, Zagazeg, Mahalla-el-Koubra, and Damanhoor.

A new genus of blood parasites, F. MARTOGGIO (*Ann. Ig. [Rome]*, 27 (1917), No. 9, pp. 561-563, pl. 1).—The genus *Hæmotrichomonas* is erected for *H. ophidium* and *H. gallinarum*.

[Anthrax and disinfection of hides] (*Jour. Amer. Leather Chem. Assoc.*, 12 (1917), No. 8, pp. 374-400, 408-424).—Papers are here presented by A. S. Ross on Anthrax (pp. 374-381); by H. J. Frisbie on the Practice and Theory on Treatment and Diagnosis of Anthrax (pp. 381-384); by A. P. Hitchens on the Nature of Anthrax and Antianthrax Serum (pp. 384-388); by V. A. Wallin on Anthrax and Hide Disinfection (pp. 396-400); and by C. L. Peck on the Treatment of Tannery Sewage (pp. 422-424). Discussions by Buswell and others of disinfection of tannery sewage by means of chlorin (pp. 389-395) and of anthrax by R. W. Hickman, Dorset, and others (pp. 408-421) are also presented.

Foot-and-mouth disease in Sweden in 1914-15, G. KJERRULF (*Meddel. K. Med. Styr. [Sveeden]*, No. 26 (1916), pp. 143, pls. 2, figs. 3).—This report deals particularly with the sanitary police measures adopted in combating foot-and-mouth disease in Sweden.

Glanders in Brazil.—Observations made on a tour of investigation, J. B. MENBY (*Am. Soc. Rural Argentina*, 51 (1917), No. 3, pp. 254-261, figs. 12).—This article summarizes the possible means of spreading glanders by contaminated drinking troughs, feed, bridles and equipment, public grazing ground, etc. An examination of all the horses and mules in the First Cavalry and Second Artillery during an epidemic of glanders showed that all the horses either had the disease as recognized by clinical symptoms or reacted positively to the mallein test. Observation cases are cited of glanders in man and of the mallein test in experimental rabbits and in horses having the disease.

The serum treatment of hemorrhagic septicemia, W. B. MACK and E. REYNOLDS (*Jour. Amer. Vet. Med. Assoc.*, 52 (1918), No. 7, pp. 810-819).—This is a detailed account of the serum treatment of the cattle disease previously noted (*E. S. R.*, 38, p. 487).

The serum was prepared by injecting horses with increasing doses of living cultures of *Bacterium bovissepticum* isolated from cattle until their serum reached such a potency that 5 mls given intravenously would protect a rabbit against approximately 1,000 fatal doses of the organism given subcutaneously at the same time. Of 140 cases receiving the treatment 60 died and 80 recovered, giving a mortality of 43 per cent as against over 95 per cent in untreated cases.

Factors apparently affecting the percentage of recoveries after vaccination are as follows: (1) Previous vaccination: Animals previously vaccinated have apparently an 11 per cent better chance of recovery. The vaccine consisted of a 48-hour bouillon culture of mixed strains of *B. bovissepticum* killed by the addition of 1 per cent phenol and used in a dose of 5 mls. This was followed in from 10 to 14 days by a 2-mls dose of a 48-hour bouillon culture of a strain of *B. bovissepticum* which had lost its virulence for cows. (2) Apparent severity of attack as judged by clinical symptoms: There is apparently no relation between the severity of symptoms and chances for recovery. A moderate delay in the administration of serum does not seem to greatly reduce the chances for recovery provided it is administered before the animal passes into the final stage of collapse. (3) Amount of serum administered: Tabulated results of varying amounts from 30 up to 1,000 mls seem to show that doses in excess of 200 mls are of little value.

The authors feel that the results obtained by the use of serum therapeutically may not be due to specific action, and that possibly nonspecific and even normal serum would produce as good results.

**The curative treatment of epizootic lymphangitis by vaccinothérapie.** *VELU* (*Bul. Soc. Cent. Méd. Vét.*, 93 (1917), No. 9-10, pp. 195-204; *abs. in Jour. Amer. Vet. Med. Assoc.*, 52 (1917), No. 2, pp. 134-136).—The author presents the details of eight cases treated by a polyvalent anticyptococcic pyovaccine and summarizes his observations as follows:

After the first injection of the vaccine the negative stage is immediate; it lasts from 2 to 5 days, according to the dose given. The following positive stage is longer, varies with the dose injected up to 10 days, and lasts on an average from 5 to 6 days. After the end of the positive stage, the disease resumes its normal course, about 5 to 15 days after the injection of the vaccine.

A second injection, made during the negative stage, gives rise to a lasting aggravation of the disease. When made at the end of the positive stage it is followed by the appearance of phenomena absolutely identical to those that follow the initial injection. When made at the proper time, before the end of the positive stage, the negative phase is less severe; it appears later, toward the second or third day, does not last so long as after the first injection, and even after the third or fourth injections there is only a retarded progress in the recovery. The best time for renewing the injections is when the positive stage is at its height.

The formation of lasting or only predominating positive stages allows the complete cicatrization of the abscesses in 20 to 30 days after they are punctured, providing the puncture has been made after the first injection. The doses, which give rise to severe positive stages, vary with the individual susceptibility and the degree of acuteness of the affection. A strong dose produces a severe negative stage sometimes without a positive stage. Too weak a dose gives a slight negative stage and a short and slightly confused positive one.

"Improvement of the lesions and their rapid cicatrization require constant watching. Interference brings an aggravation of the disease. It is absolutely necessary to open very freely and thoroughly all the abscesses and surrounding tissues as soon as the pus is well formed. Abscesses which have cul-de-sac, fistulous tracts, or those with pale, old granulations do not progress toward rapid cicatrization. Injections must be continued until complete recovery, even when a positive, well-marked stage seems to show it. The local treatment, besides the early punctures, must consist of only ordinary antiseptics without washing and needs to be renewed only every 3 or 4 days. In some cases the cryptococci disappear from the pus before the complete repair of the lesions, and then there is general sterilization of the organs before the final cicatrization."

**Report on ixodic lymphangitis.** *E. M. JARVIS* (*Vet. Jour.*, 74 (1918), No. 512, pp. 44-53).—This disease, or tick pyemia, is defined as "an inoculable disease originating in primary causes through the agency of Amblyomma ticks as mechanical carriers. The infective organisms are of telluric origin, and the invasion is usually of mixed microorganisms. The disease is usually characterized by suppuration, ulceration, and necrosis."

The article discusses the disease from the point of view of its history, geographical distribution, etiology, clinical symptoms, dissemination of the virus, and surgical, antiseptic, medicinal, and prophylactic treatment.

**The bacteriotherapeutic treatment of ulcerous lymphangitis.** *C. TRUCHE* (*Ann. Inst. Pasteur*, 31 (1917), No. 5, pp. 209-214).—Noted from another source (*E. S. R.*, 37, p. 583).

**The vitality of the rinderpest virus outside the animal body under natural conditions.** *A. W. SHILSTON* (*Mem. Dept. Agr. India, Vet. Ser.*, 3 (1917), No. 1, pp. 32, pls. 4).—"The length of time that the rinderpest virus is able to survive in blood from a sick animal kept at air temperature in an open vessel varies within wide limits; in one observation such blood was noninfective after three



days' exposure, while in another it remained infective for 51 days, although putrefaction set in after a few days' exposure, and by the thirtieth day the blood was completely desiccated. In two other observations blood was still infective after nine days' exposure to the air, and in a third it was infective after seven days' but noninfective after nine days' exposure. In two observations the virus maintained its vitality in bone marrow for nine days, but in one of these cases infectiveness was lost after 15 days. Meat was infective after three days in one observation when blood from the same animal was noninfective within that period; in another case meat remained infective for five days.

"Further tests are necessary to determine the factors influencing the survival of the rinderpest virus in animal tissues under natural conditions. The temperature at which the material is kept appears to have a considerable effect, possibly in determining the rate and character of the putrefactive changes taking place, but it has been shown that these may not destroy the virus as rapidly as many authorities have stated to be the case."

A new method for the separation of toxins, particularly tetanus toxin, E. S. LONDON and V. M. ARISTOVSKY (*Compt. Rend. Soc. Biol. [Paris]*, 80 (1917), No. 15, pp. 756-758; *abs. in Chem. Abs.*, 12 (1918), No. 1, pp. 43, 44).—The method is called a method of specific coagulation by ions, and depends upon the specific property of the tetanus toxin of diminishing the surface tension of the colloidal particles of culture bouillon and precipitating itself on the surface of those particles whose surface tension corresponds to the distension of the toxin itself. By selecting an electrolytic substance whose ions are capable of exercising a pressure on the surface of the particles charged with the toxin, a coagulation can be formed containing the toxin.

The method employed for tetanus toxin consists of first adding to the culture bouillon ammonium sulphate in a concentration of 17 gm. per 100, centrifuging, and rejecting the precipitate. On addition to the filtrate of ammonium sulphate (1 to 3 gm. per 100), the precipitate which forms contains the toxin. The toxic conglomeration dried in a vacuum is dissolved and reprecipitated by ammonium sulphate of the right strength until animal tests show that further purification will not increase the toxicity of the preparation.

This method should be considered only as a scheme which must be modified each time, depending upon the quality of the substances used in the preparation of the bouillon, the toxicity of the cultures, etc., but it is the opinion of the authors that it is a method of general application in the preparation of toxins and ferments.

An antigen for use in complement fixation in tuberculosis, M. S. FLEISHER and G. IVES (*Jour. Lab. and Clin. Med.*, 3 (1918), No. 5, pp. 302-305).—The antigen described is prepared as follows:

Tubercle bacilli from a number of different strains are isolated from sputum and grown on Petroff's medium for six or eight weeks. The organisms are then transferred to a sterile open Petri dish, dried overnight in an incubator at 37° C., transferred to a sterile mortar, and ground thoroughly for three or four hours with the addition of a small amount of distilled water. Sufficient 0.85 per cent sodium chlorid is then gradually added to make a 0.5 per cent suspension of bacteria, the grinding being continued until the bacteria form an even suspension. Finally enough of 5 per cent carbolic acid is added to equal one-tenth the volume of the sodium chlorid solution.

The antigen is considered to be a suspension and a watery extract of tubercle bacilli, both of which have the power of fixing complement in the presence of the sera of tuberculous individuals. The entire antigen is stronger than either the fluid or the suspended matter alone. From results obtained with the

antigen, the authors believe that it is the equal of any of the antigens proposed by others and that it has the advantage of being sterile and stable, and possibly more sensitive.

Vascular stomatitis of horses and cattle, J. R. MOHLER (*Jour. Amer. Vet. Med. Assoc.*, 52 (1918), No. 4, pp. 410-422).—This paper, presented at the 1917 meeting of the American Veterinary Medical Association, at Kansas City, Mo., includes later data than those previously noted (E. S. R., 37, p. 81).

Researches upon abortion of cattle, W. L. WILLIAMS (*Rpt. N. Y. State Vet. Col. 1915-16*, pp. 117-198, figs. 9).—In this discussion, which is in continuation of reports previously noted (E. S. R., 38, p. 183), the author considers the source and date of intrauterine infection, the immunity of contagious abortion, researches in a large dairy herd, the influence of copulation and other agencies upon the agglutinating power of the blood, and diseases of newborn calves. An outline of recommendations for control is included.

A preliminary study of the pathology and bacteriology of ovaritis in cattle, C. P. FITCH (*Rpt. N. Y. State Vet. Col. 1915-16*, pp. 199-208).—This is a preliminary report of investigations under way which have led the author to consider the following tentative conclusions justified:

"Cystic degeneration of the ovaries of cattle is common. The character of the cysts is often simple, but cystic corpora lutea or 'hemorrhagic cysts' are found. Adenocystoma and papillomatous and carcinomatous cysts are relatively uncommon. Cultures made from cystic ovaries of cattle show a variety of organisms to be associated with this condition."

The vaccine treatment of Texas fever, R. L. RHEA (*Vet. Notes*, 11 (1917), No. 1, p. 3).—The successful treatment of two cases of Texas fever by the use of a combined streptococcus and staphylococcus vaccine is recorded by the author.

The etiology and mode of infection in white scours of calves, W. A. HAGAN (*Cornell Vet.*, 7 (1917), No. 4, pp. 263-283).—A summary of the present status of knowledge of this disease.

Investigations have shown that "a large percentage of calves are born with infected meconium. *Bacillus coli* and certain cocci are the organisms found. The same organisms are found in the fetal fluids and utero-chorionic space in the sealed uteri of apparently normal cows. The utero-chorionic space is first infected, followed by the fluids and lastly, the meconium. The infection reaches the meconium by swallowing of the amniotic fluid by the calf. The infection probably reaches the utero-chorionic space by passing through the cervix uteri from the vagina before the seal is formed, and persisting there throughout pregnancy.

"The infection frequently existing in the intestine of the unborn calf sometimes produces scouring before birth, but usually induces an acute toxic condition with diarrhea soon after birth. These diarrhetic feces are highly virulent to other calves. Ordinary disinfection is insufficient to deal with this disease because of the number of calves born with the infection contained within them. These calves will develop the disease despite the most rigid disinfection of their surroundings and care used with their food."

Hog cholera in Argentina, F. ROSENBUSCH, J. ZABALA, and R. GONZÁLEZ (*As. Soc. Rural Argentina*, 51 (1917), No. 9, pp. 657-665, pls. 7, figs. 5).—This is a discussion of the nature and occurrence of hog cholera in Argentina.

Trichinosis in Denmark, J. FIBIGER (*Hospitalstid. [Copenhagen]*, 60 (1917), No. 42, pp. 1021-1048; *abs. in Jour. Amer. Med. Assoc.*, 69 (1917), No. 26, p. 2112).—The author points out that meat from a single hog infested with

trichinae may start an epidemic such as occurred at Habersleben, where 37 persons were affected and 101 died.

Fern poisoning or fern staggers, B. T. SIMMS (*Oreg. Countryman*, 10 (1917), No. 2, pp. 15, 33, 34).—The author reports that a very heavy loss of horses in western Oregon extending over several months has resulted from fern poisoning. The cause appears to be the same as that described by Hadwen and Bruce in a report previously noted (E. S. R., 38, p. 589).

Insect transmission of infectious anemia of horses, C. W. HOWARD (*Jour. Parasitology*, 4 (1917), No. 2, pp. 70-79).—A brief discussion of swamp fever, including a review of previous investigations, followed by a report of experimental work conducted at the Minnesota Experiment Station. The results of the experiment indicate that the disease can be carried from one horse to another by the stable fly, but the author is not fully convinced that insects are the usual or only carriers of the disease.

The treatment of pneumonia by intratracheal injections, CHAMBERS (*Vet Jour.*, 73 (1917), No. 510, pp. 421-425).—The author reports upon his experience in the treatment of pneumonia at a port of embarkation, which extended over a period of ten months.

He found a remarkable decrease in the mortality among horses to follow the routine procedure of giving an intratracheal injection of 10 cc. of a slightly warm solution of formalin in water or 10 cc. of creosote 1 part and 6 per cent alcohol 10 parts to every animal admitted to the port with catarrh or catarrhal fever. Over 400 cases of chest affections were treated by both and while the two mixtures appear equally beneficial the author favors the use of creosote on account of its nonirritability. With the formalin solution one or two injections may be given daily but it is not advisable to make more than four or five consecutive injections, while with creosote four or more consecutive injections may be given without danger.

Fowl typhoid, FRICKER and ROEPKE (*Centbl. Bakt. [etc.]*, 1. Abt., Orig. 7 (1917), pp. 125-139; abs. in *Jour. Compar. Path. and Ther.*, 30 (1917), No. 3, p. 265-266).—This is a report of studies of a disease identical with that first described by Pfeiffer and Rehse in 1912 (E. S. R., 30, p. 385) as due to *Bacillus typhi gallinarum alcolifaciens*. The present paper deals mainly with the chemical and agglutinating properties of this organism.

### RURAL ENGINEERING.

Surface irrigation for eastern farms, F. W. STANLEY (*U. S. Dept. Agr. Farmers' Bul.* 899 (1917), pp. 35, figs. 21).—This publication "discusses the so called surface methods of irrigation and their possibilities for the farmer who pocketbook, crops, and market facilities do not justify consideration of the other methods." Among the points discussed are the conditions adapted to surface irrigation, the amount of water needed in furrow irrigation, obtaining a water supply, conveying the water to the land, details of the pumping plant, distributing the water by terra cotta pipe systems, reinforced concrete, and sewer pipe, and applying the water to crops by the use of portable pipe and hose and furrow irrigation, and the cost of irrigation.

Artificial spray irrigation (*Tijdschr. Nederland. Heidemaat*, 29 (1917), No. 7, pp. 193-210, pls. 2, figs. 2).—This article gives data on the design, installation, operation, and cost of overhead irrigation systems.

The quantities of water and the frequency of irrigation as influenced by the physical properties of soil, A. MÜNTZ and E. LAINE (*Bul. Soc. Encour. Indus. Nat. [Paris]*, 116 (1917), 1, No. 2, pp. 386-397; abs. in *Internat. Inst. Agr. [Rome]*, *Internat. Rev. Sci. and Pract. Agr.*, 8 (1917), No. 7, pp. 974-978).—Further experiments (E. S. R., 32, p. 586) are reported on the relation between

permeability of soils and the amount and velocity of irrigation. Soils classed as impervious, slightly pervious, and pervious were used in the experiments. It is concluded that the module and width of irrigated plats should be such that the velocity of the irrigation water will be high for very pervious soils and low in relatively impervious soils.

A general conclusion from these studies is that a study of the physical properties of the soil to be irrigated should precede the design of an irrigation system.

Field studies of the influence of module, of quantity and distribution of irrigation, and of frequency of irrigation on harvest are also reported, the purpose being to show the proper procedure on soils in different parts of France.

Surface water supply of Missouri River Basin, 1915 (*U. S. Geol. Survey, Water-Supply Paper 406* (1917), pp. 282+XII, pls. 2).—This report, prepared in cooperation with the States of Colorado, Montana, Nebraska, and Wyoming, presents the results of measurements of flow made on the Missouri River and tributary basins during 1915. Additional sections are included on stream-gauging stations and a list of publications relating to water resources.

The oxygen-consuming power of natural waters, G. W. HEISE and R. H. AGUILAR (*Philippine Jour. Sci., Sect. A, 11* (1916), No. 1, pp. 37-47; *abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7* (1916), No. II, pp. 1577-1579).—In connection with quantitative studies on some of the factors influencing the determination of the oxygen-consuming capacity of natural waters by means of potassium permanganate in acid solution, it is concluded that the determination of oxygen consumption at best is not an accurate measure of the organic content of a water and that such uncertain results are obtained as to make isolated determinations of very little value. "It is only when a water supply is to be examined repeatedly that the determination becomes very useful."

Minnesota road laws, compiled by L. A. SMITH (*Minneapolis: State, 1917, pp. 50*).—The text of the laws is given.

Annual report on highway improvement, Ontario, 1916, W. A. McLEAN (*Ann. Rpt. Highway Improv. Ontario, 1916, pp. 31, figs. 12*).—This is a brief report on highway improvement works and expenditures in Ontario, Canada, for 1916.

Paving economy: Road and street, C. A. MULLEN (*Montreal: Indus. and Ed. Press, 1917, pp. 98, figs. 4*).—This book deals with the economics of design, construction, maintenance, and repair of pavements for roads and streets.

Report on experimental convict road camp, Fulton County, Ga., H. S. FAIRBANK, R. H. EASTHAM, and W. F. DRAPER (*U. S. Dept. Agr. Bul. 583* (1918), pp. 64, pls. 17, figs. 2).—The operation of an experimental convict road camp, maintained for 10 months in Fulton County, Ga., is described. The camp was established as the result of the studies of convict labor for road work conducted in 1914 and 1915 by the Office of Public Roads and Rural Engineering and the Public Health Service, previously noted (*E. S. R., 36, p. 386*).

A special type of portable building, designed with a view to determining the practicability and economy of this type in comparison with other camp structures, is described. A balanced ration was installed to ascertain whether this diet and system would effect economy and promote the welfare of the convict. The honor system was followed in the discipline of the convicts, all of whom were negroes, and no attempts to escape were made.

Construction data on the cost of the various road projects are included, as well as cost data for the construction and maintenance of the camp. "Taken as a whole, the outstanding results of the experiment demonstrate that clean-

liness, comfort, and humanity in the convict camp are not inconsistent with economy and efficiency in the work of the inmates."

Progress reports of experiments in dust prevention and road preservation, 1916 (*U. S. Dept. Agr. Bul. 536* (1918), pp. 78).—New experiments begun by the Office of Public Roads and Rural Engineering during the year 1916 are described. These included experiments on bituminous macadam and bituminous gravel construction on the Russel Road in Alexandria County, Va.; bituminous gravel concrete and earth-oil asphalt on the Alexandria-Accotink Road in Fairfax County, Va.; and the bituminous surface treatment of a new gravel road leading from Gum Spring to Mount Vernon in Fairfax County, Va. In addition special experiments with corrugated metal culverts were initiated on the Texas post road in Comal and Hays Counties, Tex.

Supplementary reports on experiments previously reported (*E. S. R.*, 36, p. 188) are also included on bituminous macadam and bituminous concrete on Mount Vernon Avenue Road, Alexandria County, Va., 1915; bituminous surface treatment on Falls Road, Montgomery County, Md., 1915; bituminous macadam on Bradley Lane, Montgomery County, Md., 1915; bituminous concrete at Washington, D. C., 1915; oil asphalt-coralline rock at Buena Vista, Fla., 1915; oil asphalt-sand at Jupiter, Palm Beach County, Fla., 1915; bituminous sand and oil-limestone mixing methods at West Palm Beach, Fla., 1915; sand-asphalt at Ocala, Fla., 1915; oils, tar preparation, and calcium chlorid-coralline rock at Lemon City, Fla., 1914; oil, tar, and oil asphalt-coralline rock at West Palm Beach Fla., 1914; oil-coralline rock at Miami, Fla., 1913; bituminous surface treatment on Rockville Pike, Montgomery County, Md., 1913; tar preparation and oil surface treatment at Washington, D. C., 1912; bituminous concrete, cement concrete, oil cement concrete, vitrified brick, and bituminous surface treatment on concrete at Chevy Chase, Md., 1912; bituminous construction and surface treatment at Chevy Chase, Md., 1911; oil cement concrete, oil asphalt, and tar and fluxed native asphalt at Jamaica, N. Y., 1911; oil asphalt gravel at Ames, Iowa, 1910; tar and oil preparations at Knoxville, Tenn., 1910; slag, lime, waste sulphite liquor, and tar at Youngstown, Ohio, 1910; sand-clay at Dodge City, Garden City, Bucklin, and Ford, Kans., 1908; and Kentucky rock asphalt at Bowling Green, Ky., 1907.

Mechanical culture and draft animals, H. DE LAPPARENT (*Journ. Agr. Prod. n. ser.*, 30 (1917), No. 10, pp. 177, 178).—Data from French sources are given on the cost of maintenance of horses, mules, and cattle as draft animals, it being shown that cattle can be maintained for about one-fourth the expense of horses and mules. The economic conclusion is drawn that the development of mechanical culture should involve the raising of cattle for draft animals, thus making a great reduction in the number of mules and horses actually needed, particularly in regions where the use of cattle as draft animals is not unusual.

Review of mechanical cultivation, M. RINGELMANN (*Bul. Soc. Encour. Indus. Nat. [Paris]*, 116 (1917), I, No. 2, pp. 399-418, figs. 7).—This outlines the duties of the French Service for soil cultivation, reviews recent mechanical cultivation experiments in France, and describes French, English, and American mechanical cultivating machinery.

Tests of mechanical cultivation, J. DISSOURBAY (*Prog. Agr. et Vit. (Ed. F&H-Centre)*, 37 (1916), Nos. 49, pp. 542-548; 50, pp. 561-563).—Four days' plowing tests of five tractors on stony calcareous clay soil, tenacious calcareous clay, siliceous clay, and rocky calcareous clay soil are reported and discussed.

Tests of mechanical cultivation, E. ZACHAREWICZ (*Rap. Trav. Dir. Serr. Agr. [Dept. Vaucluse, France]*, 1915-16, pp. 186-199).—Tests of six French tractors on deep and shallow plowing are reported.

Actual situation of motor cultivation in Department of Haute-Garonne (France), G. HÉNON (*Jour. Agr. Prat. Vit et Econ. Rurale Midi France*, 112 (1916), No. 8-12, pp. 190-210).—This is a discussion of the economics of motor cultivation in Department of Haute-Garonne, France.

Tests of motor cultivation at Périgueux, E. BEZIAF (*Prog. Agr. et Vit. (Ed. Est-Centre)*, 38 (1917), No. 18, pp. 421-428, figs. 2).—Tests of five American tractors on direct draft plowing under French conditions on February 22 and 23, 1917, are reported. All the tractors were of the two-drive wheel type and with either one or two guide wheels. Three bottom plows were used.

It is concluded that the American tractors are far from ideal for French use.

A study of the plow bottom and its action upon the furrow slice, E. A. WHITE (U. S. Dept. Agr., *Jour. Agr. Research*, 12 (1918), No. 4, pp. 149-182, pls. 4, figs. 26).—This paper, contributed from the New York Cornell Experiment Station, "is an attempt to begin a fundamental analysis of the plow bottom and its work." It includes (1) a study of the forms of plow bottoms, (2) an attempt to analyze the motion of the soil particles as they pass over the surface, and (3) a mathematical analysis of the surfaces of the most important historical plow bottoms which were designed to be geometrically exact.

"There is considerable evidence, based upon field experience, which indicates that a portion of a hyperboloid of one sheet is the proper form for the surface of a plow bottom. So far as is known this hypothesis awaits definite proof."

Electricity on the farm, C. O. CRANE (*Reclam. Rec. [U. S.]*, 8 (1917), No. 10, pp. 471-473, 476).—This article deals with the economics of using electrical power for various farm and household operations, with special reference to conditions in southern Idaho. It is stated that under the prevailing rate of 23 cts. per kilowatt-hour for electrical power in southern Idaho, man power at 15 cts. an hour is about thirty-two times as expensive as electrical power. Considerable data are given on the electrical power requirements for various farm operations, including irrigation pumping and cost data therefor.

"There are now 1,770 rural customers using current for lighting residences and barns, 273 for domestic power, 312 for irrigation, 18 for grinding feed, 130 for cooking and water heating, 80 for washing machines, 1,220 for flatirons, and 1,000 for some of the other labor-saving domestic appliances."

Modern methods of lighting and ventilating cow stalls, A. M. KUIJSTEN (*Cultura*, 29 (1917), No. 347, pp. 216-228, pl. 1).—Lighting and ventilating methods are described and mathematical formulas given.

## RURAL ECONOMICS.

Rural planning and development, T. ADAMS (*Ottawa: Com. Conserv. Canad.*, 1917, pp. [9]-281, pls. 65).—This report is a study of rural conditions and problems in Canada, and discusses present systems of surveying and planning land in rural areas, rural transportation and distribution (railways and highways), rural problems that arise in connection with land development, organization of rural life and rural industries, government policies and land development, returned soldiers and land settlement, and provincial planning and development legislation.

The report concludes that several matters require special attention, and recommends that "the federal and provincial government legislation and machinery for dealing with the control of the planning, settlement, and development of land be extended and improved."

"There should be closer cooperation than hitherto between federal, provincial, and municipal governments, and between different branches of the public service, in regard to all matters dealing with land."

"The surveying branches of the governments should be strengthened and more comprehensive surveying work assigned to them.

"A complete and coordinated system of federal, provincial, and municipal administration of land resources should be devised, with the whole organization centralized in a department or permanent commission of the federal government.

"Definite steps should be taken by joint government action to prevent the holding of agricultural land by absentee landlords for purely speculative purposes. The operations of vendors of real estate should be regulated, so as to prevent misrepresentation and other immoral practices in connection with the sale of land, and all real estate operators should be licensed by governments under safeguards designed to prevent improper dealing in land.

"Provincial governments should reconsider their systems of administering colonization, highways, municipal affairs, and public health, with special regard to the need of securing more cooperation and efficiency in connection with land and municipal development than is possible under present conditions and for increasing the responsibilities and powers of municipal authorities, under the advice of a skilled department of local government in each Province.

"To meet a temporary need, the federal government should take an active interest in the housing of workers engaged in munition plants, particularly in government arsenals and in small towns and rural districts where there is lack of strong local government. The federal government should either require adequate accommodation and proper sanitary conditions to be provided at a reasonable cost for those who are engaged in the service of the country, or itself assist in making that provision, as is being done in Great Britain and allied countries."

United States Food Administration policies and plan of operation [with reference to] wheat, flour, and bread (*Washington, D. C.: U. S. Food Admin., 1917, pp. 171, fig. 1*).—This publication outlines the world situation with reference to wheat, and contains a general statement with reference to the marketing of the 1916 crop, and as to the supply for 1917. It describes the plan of the Food Administration for the organization of government buying, with suggestions for the saving of wheat. It also contains orders and proclamations under the Food Control Act, and instructions and explanations issued by the Food Administration with reference to conduct of flour mills and the milling trade. \*

Agriculture clubs in California, B. H. CROCHERON (*California Sta. Circ. 190 (1918), pp. 24, figs. 14*).—The author states that the assumption on which agriculture clubs start are as follows:

"(1) The agricultural institutions of the State and nation have information which, applied to farming, will increase farm profits. (2) Many boys and some girls want to make money by farming and would like to be shown how. (3) The chances for individual success are increased when several persons in a neighborhood undertake the same work, an added interest for which comes through competition."

He discusses briefly the history of the agriculture clubs in California, and suggests a model constitution and rules with reference to conducting various club activities.

Value of a small plot of ground to the laboring man, W. C. FUNK (*U. S. Dept. Agr. Bul. 602 (1918), pp. 10, pls. 3, fig. 1*).—This is a study of food raised by operators in southern cotton-mill towns, and is based on records of 548 gardens, 165 poultry flocks, 75 cows, and 62 pigs.

It was found that the average size of the gardens was 723 sq. yards, the average value of the vegetables raised \$29.87, and the average cash expenditure

3154. The average size of the flocks was 13.2 hens, and the number of eggs sold and sold was 86 dozen, valued at \$19.35. In addition, the number of fowls sold and used was 36, valued at \$11.07, making a total income of \$30.42 per flock. The average cash expenditure was \$16.22. In the case of the pigs, the average purchase price was \$6.34, and the average live weight at killing was 270 lbs., valued at \$24.30. The cost of feed was \$12.12, leaving a net return of \$5.84 after deducting the purchase price. The value of the produce from the dairy cow was estimated at \$119.90, and the average cost of feed was \$30.49 a year.

A study of haymaking crews and labor costs, H. B. McCLURG (*U. S. Dept. Agr. Bul. 578 (1918), pp. 50, figs. 13*).—This bulletin is based on a study of the methods of gathering hay from the different parts of the Northeastern and Central States. Altogether it describes 53 different methods found, including cost data.

The author points out that small crews often were more efficient than very large ones. Five push rakes often will put into the stack as much hay as seven, since the latter, where the haul is short, will bring the hay in much faster than it can be stacked. Baling hay from the field was found to be the cheaper system of putting hay into the bale, but this system usually can be used to advantage only in regions where little or no rain falls during the haying season. The two reasons given why the hay loader is not in more general use were the relatively large cash outlay entailed and the fact that handling hay on the wagon with a loader is very heavy work as compared with driving a push rake.

A system of accounting for fruit shipping organizations, G. A. NAHATOLL and J. R. HUMPHREY (*U. S. Dept. Agr. Bul. 590 (1918), pp. 60*).—The system outlined in this bulletin is intended to cover all operations incident to the handling of growers' supplies and of the growers' fruit, from the time it is received at the packing-house until final returns have been made for it. The aim has been to avoid duplication and to reduce clerical work; care has been used to provide a method applicable to the working conditions of the local offices, which are not always favorable, and to allow for a proper division of labor.

This book also gives a brief discussion and sample copies of the various types of forms and records necessary to complete the system.

A plan for short term farm loans in Connecticut, G. C. SMITH (*Conn. Agr. Col. Ext. Serv. Bul. 10 (1917), pp. 8, figs. 2*).—This pamphlet explains a plan for a short-term loan to farmers as adopted by banks and trust companies in Connecticut, and includes forms of statements used, together with suggestions as to methods of obtaining credit.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 4 (1918), No. 2, pp. -20*).—This number contains the usual data with reference to estimated farm value of important products, range of prices of agricultural products at important centers, and range of prices received by producers in the United States, and data as to the estimated number and value of the principal classes of live stock. It also contains special articles on the weight of mature farm horses and mules, price of live stock by ages or classes, yearly marketings of live stock, monthly price of milch cows, beef cattle, calves, sheep, wool, hogs, the United States foreign trade in meat animals and meat products, number of live stock in the principal countries and changes since the outbreak of the war, number of horses used per plow, and depth of plowing, together with other miscellaneous data.

Agriculture in Oklahoma, L. C. SNIDER (*Okla. Geol. Survey Bul. 27 (1917), pp. 131-142, 247-325, figs. 8*).—These pages contain statements with reference to the soils, principal crops, and live stock, together with data for each county showing the physiography, geology, industries, and population.



## AGRICULTURAL EDUCATION.

**History of the Michigan Agricultural College and biographical sketches of trustees and professors, W. J. BEAL** (*East Lansing, Mich.: Mich. Agr. Col., 1915, pp. VIII+519, pls. 2, figs. 266*).—Chapters are devoted to accounts of the laying of the foundation of the college, the administrations of its successive presidents, courses of study, extension work, methods of teaching, manual labor, influence of the grange and farmers' clubs upon the college, college publications, the campus and buildings, attendance, endowments and appropriations, etc. An appendix contains the opinions of alumni, including some who have taught only in a separate college of agriculture or in an agricultural college connected with the university and others who have had the dual experience of teaching in both types of institutions, as to whether an agricultural college should be independent or united with a university.

Reports of the development commissioners on their proceedings during the years ended March 31, 1913, 1914, 1915, 1916, and 1917 (*Rpt. Develop. Comrs. [Gt. Brit.], 3 (1913), pp. [2]+72; 4 (1914), pp. [2]+77; 5 (1915), pp. [2]+14; 6 (1916), pp. [2]+12; 7 (1917), pp. [2]+15*).—A detailed review of action taken and progress made under the Development Act is given for each year. The report for 1913 also contains a brief explanation of the legal position of the commissioners under the act, and some of the practical results from it.

In the report for 1917 the commissioners state that since the commencement of the war advances from the development fund have been mainly confined to schemes already established, for which just sufficient advances have been recommended to secure continuity. They have also recommended expenditures on certain new schemes in order to meet war conditions, particularly in connection with food supply and natural products, the two most important advances recommended during the year being \$607,500 for the purchase of an estate for sugar-beet growing and \$243,000 for improving the fish food supply. Expenditures were also recommended for a largely increased supply of plants for afforestation purposes and increased growings of flax for aeroplane cloth, as well as for the preparation of preliminary surveys and reports of projects of development for commencement after the war when the employment of labor upon a large scale may be desirable. The total of recommended expenditures during the year for agriculture, rural industries, and forestry was \$1,300,916, including loans amounting to \$607,500. The sum total of advances recommended for this purpose up to March 31, 1917, was \$9,116,952, including loans amounting to \$1,370,087.

**Report of the agricultural and housekeeping schools for 1915-16 (Aarsder, Offentl. Foranst. Landbr. Fremme, 1916, II, pp. VIII+359)**.—This is a detailed report on the faculty, students, equipment, instruction, farm work, and receipts and expenditures of the agricultural and housekeeping schools in Norway.

**Education (Proc. 2. Pan Amer. Sci. Cong., 1915-16, vols. 4, pp. XV+650, figs. 6; 5, pp. XVII+658, figs. 11)**.—These volumes contain the report of Section IV, Education, of the Second Pan American Scientific Congress, held in Washington, D. C., December 27, 1915, to January 8, 1916. Among the papers and discussions in volume 4 are the following relating to agricultural education, which have been previously noted (*E. S. R.*, 34, p. 307): Education for the Baccalaureate Degree as Administered in Agricultural Colleges, by A. C. True (pp. 80-87); A National System of Agricultural Education, by H. J. Waters (pp. 226-229); A Decade in Agricultural Education, by A. M. Soule (pp. 229-241); and Agricultural Instruction, by J. Comallonga y Mena (pp. 305-344).

Volume 5 contains, among others, papers on agricultural education as follows: Scientific Agriculture or Agricultural Education in Brazil, by L. F. S.

Carpenter (pp. 341-345), a review of the status and further needs of agricultural education in Brazil; Agriculture in Secondary Schools with Special Reference to the State of Minnesota, A. V. Storm (pp. 345-353), which deals with the development of State-aided secondary agricultural education in Minnesota; Agricultural Education in County Schools, by H. L. Russell (pp. 353-357), in which are discussed the efforts that have been made in Wisconsin to establish agricultural education in secondary schools through a system of county agricultural schools and county short courses in agriculture; The American College of Agriculture, by F. B. Mumford (pp. 357-359), which discusses briefly the proper function and purpose of the agricultural college, the author holding that the real function of the undergraduate course in agriculture is and should be to train men thoroughly for agriculture as a vocation, and that the training of teachers, investigators, and technical experts must be accomplished by graduate departments; Agricultural Education, by E. Davenport (pp. 360-363), which treats of the two great objects in agricultural education, viz., to train for farming and to fit for country life; Agricultural Extension Work, by G. I. Christie (pp. 363-369), in which are considered the needs of agriculture and country life, and a few of the mediums and methods employed in extension work to meet these needs; and What Preparation Should be Required of Students for Admission to National and State Colleges of Agriculture, by B. H. A. Groth (pp. 569-574).

How school gardens tend to direct a natural course in botany, GENEVIEVE MOSKUCH (*School Sci. and Math.*, 18 (1918), Nos. 1, pp. 36-42; 2, pp. 124-129).—The author outlines and discusses, by weeks, a 10 weeks' course in botany developed with a class of seventh grade girls and boys. Only 50 hours of class time were given to the course, but individual members of the class were permitted to work in the garden at odd times. In conclusion, attention is called to the difference in the sequence in a course in botany founded directly and entirely on garden work, as the one described, and the ordinary textbook work.

School gardens and greater production, L. A. DEWOLFE, R. P. STEEVES, J. B. DANDENO, R. FLETCHER, A. W. COCKS, F. W. BATES, and J. H. KITELEY (*Agr. Gaz. Canada*, 4 (1917), No. 12, pp. 1073-1079, figs. 7).—The aims and methods of school-garden and food-production work in Nova Scotia, New Brunswick, Ontario, Manitoba, and Saskatchewan are outlined and some of the results obtained are noted.

Rural school fairs, W. J. REID, L. A. DEWOLFE, R. P. STEEVES, J. H. McQUAT, J. C. MAGNAN, R. S. DUNCAN, F. W. BATES, A. W. COCKS, J. McCAIG, and J. C. READEY (*Agr. Gaz. Canada*, 5 (1918), No. 1, pp. 52-73, figs. 10).—These reports by agricultural education officials deal with the organization and development of rural school fairs in Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Saskatchewan, Alberta, and British Columbia.

Accomplishments of boys' and girls' clubs in food production and conservation, O. H. BENSON (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 74 (1917), No. 163, pp. 147-157).—The author describes the work and some of the results of the boys' and girls' clubs in food production and conservation in 1916. It is stated that it cost the Federal Government, States, and local people 79 cts. per capita to supervise, direct, instruct, and encourage boys and girls in food production work. As a result, it is estimated that they produced an average of \$20.06 worth of food for the Nation, thus returning \$20.17 net profit on the investment.

Ten lessons on our food supply, W. G. VINAL (*Gen. Sci. Quart.*, 2 (1918), No. 2, pp. 337-344).—This is a summary of lessons taught in the Rhode Island Normal School, and intended to be merely suggestive as to the method of teaching. The lessons deal, respectively, with the organization of the course, com-

munity projects in food conservation, local community projects, the fundamentals of an adequate diet, the cost of breakfast, a comparison of the cost of breakfast for the different members of the class, some of the reports on individual projects, new foods and methods, a war breakfast, and organizing the school into a working unit.

### MISCELLANEOUS.

**Report of Porto Rico Station, 1916** (*Porto Rico Sta. Rpt. 1916*, pp. 31, pls. 5).—This contains the organization list, a summary by the agronomist in charge as to the general conditions and lines of work conducted at the station during the year, and reports of the chemist and assistant chemist, horticulturist, assistant horticulturist, entomologist, and plant pathologist, the experimental features of which are abstracted elsewhere in this issue.

**Report of the experiment station committee of the Hawaiian Sugar Planters' Association, 1917** (*Hawaii. Sugar Planters' Assoc., Rpt. Expt. Sta. Com., 1917*, pp. 25).—This includes a report by the director on the work of the station for the fiscal year ended September 30, 1917.

**Report of the executive committee of the Commonwealth Advisory Council of Science and Industry, 1916-17** (*Advisory Council Sci. and Indus., Aust., Rpt. 1916-17*, pp. 56).—This report covers the period from April 14, 1916, to June 30, 1917. It discusses the policy and nature of the work of the committee, including the collection of information for the use of executive and State committees and a proposed permanent institute, the distribution of research grants of about \$17,000, and some of the principal results thus far obtained.

**Monthly Bulletin of the Ohio Experiment Station** (*Mo. Bul. Ohio Sta., 3* (1918), No. 1, pp. 31, figs. 14).—This contains several articles abstracted elsewhere in this issue; Permanent Pastures, by C. W. Montgomery; Ox Warble Flies, an abstract of the article previously noted (*E. S. R.*, 37, p. 464); and notes.

**Monthly bulletin of the Western Washington Substation** (*Washington Sta., West. Wash. Sta., Mo. Bul., 5* (1918), No. 11, pp. 157-172).—This number contains brief articles on the following subjects: Contagious Abortion of Cattle, by J. W. Kalkus; The Organization of Cooperative Agricultural Associations, by A. Hobson; Tomato Culture in Western Washington, by J. L. Stahl; Spring-sown Grain Crops for Western Washington, by E. B. Stookey; Artificial Incubation, by Mr. and Mrs. G. R. Shoup; Orchard Spraying, by A. Frank; and a garden planting calendar.

**Guide to plats** (*Massachusetts Sta. Guide to Plats, 1916*, pp. 20, pls. 2, fig. 1).—Plans for the field plats of the agricultural department of the station are given, together with a description of the plats and their treatment and brief notes on the principal results obtained.

## NOTES.

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**California University and Station.**—The formal dedication of the first of the new buildings for the Citrus Substation and Graduate School of Agriculture was held March 27.

R. S. Valle, assistant professor of orchard management at the Citrus Substation, has accepted an appointment from the National Armenian Relief Commission to go to Persia as agriculturist. His work is expected to be of an extension nature and designed to rehabilitate the agricultural interests of the region.

**Idaho University and Station.**—A substation for the study of problems incident to high altitudes was authorized at the last session of the legislature. Action has been taken by the board of regents looking toward its establishment on State land at Felt, in Teton County, at an elevation of approximately 8,300 feet.

In response to direct requests from farmers, the department of bacteriology has sent out this year cultures sufficient for the inoculation of 15,000 acres of legumes. The cultures are sold to farmers of Idaho and neighboring States at the actual cost of manufacture, exclusive of equipment, of approximately 20 cents per acre.

J. S. Jones has resigned as director and chemist of the station and professor of agricultural chemistry in the university, effective June 30, and has assumed charge of one of the Government nitrate plants under the Ordnance Division of the War Department. Other resignations include W. C. Edmundson as assistant professor of horticulture and assistant horticulturist to accept a position with the Bureau of Plant Industry of the U. S. Department of Agriculture, Glenn S. Ray as assistant professor of farm crops to become agricultural advisor for Franklin County, Wash., and A. C. Burrill as station entomologist to accept a position with this Department as extension entomologist with headquarters in eastern Washington. Dr. T. L. Hilla, bacteriologist of the university and station, has been granted leave of absence for the period of the war and has been commissioned first lieutenant in the Sanitary Corps.

L. E. Longley, formerly of this Department, has accepted an appointment as assistant professor of horticulture and assistant horticulturist. R. H. Smith has been appointed entomologist and has been detailed to southern Idaho for special work in the study of the clover aphid.

**Purdue University and Station.**—O. E. Reed, of the Kansas College and Station, has been appointed chief of the department of dairy husbandry beginning August 1. R. E. Caldwell, acting chief of the department, has resigned to engage in commercial work. Chester G. Starr, acting associate in animal husbandry, has been appointed agricultural agent for Tazewell County, Ill. P. W. Mason, assistant professor of entomology, has accepted a position in the Division of Deciduous Fruit Insects in the Bureau of Entomology of the U. S. Department of Agriculture.

**Massachusetts College.**—A new department of horticultural manufactures has been established with W. W. Chenoweth of the pomological department as

its head. The work to be developed will deal principally with questions of preserving fruits and vegetables, utilizing by-products which have formerly been wasted, and the like.

Benjamin G. Southwich, of the Connecticut College, has been appointed demonstrator of farm management, vice Wesley H. Bronson now in war service. Daniel J. Lewis has been appointed assistant to the director of extension service. Harry R. Francis, of the forestry department of Syracuse University, has been appointed garden supervisor, and Wm. F. Howe, assistant in the direction of boys' and girls' club work. A. S. Thomson, assistant professor of market gardening, has been elected superintendent of schools for a group of towns in Franklin County.

**Michigan College and Station.**—Vocational teacher training in agriculture and home economics was begun in March under the provisions of the Smith-Hughes Law. E. L. Grober has been appointed in charge of agricultural teacher training work, and Miss Elizabeth Frazer in home economics.

The botanical laboratory has been named the Beal Botanical Laboratory in honor of Dr. W. J. Beal, professor emeritus.

L. H. Cooleidge, assistant professor and research associate in bacteriology, and I. F. Huddleson, research assistant in bacteriology, have enlisted in the Army Medical Corps. Miss L. Zae Northrop and Dr. E. T. Hallman have been appointed research associates in bacteriology. Chas. Robinson, chemist of the station, C. F. Murphy, graduate assistant in plant physiology, B. E. French and T. E. Friedenmann, instructors in chemistry, and J. Frank Morgan, research assistant in bacteriology, have been granted leave of absence for military service. Ray Nelson has been appointed research associate in plant pathology, vice J. H. Muncie. Everett Doherty, instructor in agricultural chemistry at the Oregon College, has been appointed assistant professor of chemistry beginning next September. Dr. W. L. Chandler, instructor in parasitology at Cornell University, has been appointed research associate in entomology in the station, vice Dr. G. D. Shafer.

A short course in tractor management recently held reached an attendance of 135.

**Missouri University and Station.**—Benjamin W. Tillman, of the Soil Survey of the U. S. Department of Agriculture, has been appointed extension assistant professor of soils beginning June 1. F. W. Faurot, extension assistant professor of horticulture, has resigned. A. H. Hollinger, instructor in entomology and deputy inspector of nurseries, was succeeded April 4 by K. C. Sullivan. J. L. Stadler and Cannon C. Hearne have been appointed assistants in farm crops.

**Nebraska University and Station.**—J. W. Rovner has been appointed assistant professor of dairy husbandry. Elliott Davis has been appointed assistant professor of animal husbandry, vice H. B. Pier, resigned. E. L. Jenkins, assistant professor of animal husbandry, is on leave of absence for Army service, and B. H. Thompson has resigned as instructor of dairy husbandry for the same purpose. H. M. Plum has resigned as professor of agricultural chemistry to take up chemical work in connection with war industries.

**New Jersey College and Stations.**—Two courses in farm tractor operation, continuing for two weeks each, were given at the college during March.

Experiments in the use of fertilizers on potatoes have been begun in cooperation with the State potato association. The department of entomology is making detailed maps of the area infested by the Japanese beetle, with a view to attempting its extermination.

The State seed laboratory has been unusually active in making analyses for persons interested in particular lots of seeds. Large numbers of sam-

pies of vegetable seeds have been received for test in comparison with those for previous years. Over 300 lots of seed corn, representing several thousand ear samples, have been tested with results demonstrating the urgent need for testing corn this season.

Work has been begun on a calf barn, for which the legislature appropriated \$8,000.

Dr. Louis M. Massey has been granted leave of absence as assistant professor of plant pathology at Cornell University and assigned to this station by the U. S. Department of Agriculture to conduct extension work in plant pathology. Mitchell Carroll has been appointed first assistant to the entomologist for mosquito control and experimental work.

John H. Hankinson has resigned as State leader of farm demonstration. Irving L. Owen has been appointed manager of the college farm to succeed C. S. Van Nuis. Willard C. Thompson, assistant poultry husbandman, has resigned to enlist in military service.

**New Mexico Station.**—J. R. Meeks has resigned as dairyman to take up county agent work in Indiana. Charles E. Cormany has been appointed assistant agronomist. J. M. Franklin, assistant in horticulture, has resigned to join the Navy.

**North Dakota College and Station.**—Dr. A. F. Schalk, professor of veterinary physiology in the college, has been appointed station veterinarian. James Jodkin has been appointed assistant botanist. C. J. T. Doryland, soil bacteriologist, has been granted leave of absence for six months.

**Oregon College and Station.**—At the last annual session of the board of regents, the president of the board was appointed to take charge of the special war-time work which will be carried on in connection with the regular college activities. President Kerr has been lecturing very extensively on food conservation and the war in Oregon, North Dakota, Idaho, and other States.

Two service flags, made by the home economics club and bearing 1,235 stars, have been presented to the college by the students' assembly. At the annual commencement, June 3, 192 students received degrees and 23 received certificates. The freshman and sophomore classes have been larger than ever before and the decrease in the upper classes has been merely nominal and due to heavy enlistments.

H. V. Tartar has resigned as associate professor of agricultural chemistry and station chemist to accept a position on the chemical staff of the University of Washington. R. V. Gunn, assistant instructor in agricultural economics and farm practice at the University of Wisconsin and assistant in agricultural economics at the Wisconsin Station, has been appointed assistant professor in farm management extension beginning July 1. Clair Wilkes has been appointed assistant in farm management. L. W. Wing, Jr., instructor in dairy husbandry, and Fred W. Miller, instructor in veterinary medicine, are now serving in the aviation section of the Signal Corps.

Science notes that Dr. F. E. Denny, of the University of Chicago, has been appointed research assistant in horticulture, vice J. R. Magness, effective April 1. Dr. Helen M. Gilkey, of the University of California, has been appointed assistant professor of botany and curator of the herbarium, to succeed the late H. S. Hammond.

R. W. Allen, superintendent of the Umatilla Substation at Hermiston, has resigned to accept a position with the U. S. Department of Agriculture. L. R. Breithaupt, superintendent of the Harney County Substation, has been succeeded by John Martin of the Belle Fourche, S. Dak., Substation of the Bureau of Plant Industry of this Department.

**Pennsylvania College and Station.**—The resignations are noted of L. C. Tomkins, April 1, as instructor in dairy husbandry extension, and R. S. Spray as assistant in botany, April 10. H. D. Edmiston, for many years assistant in agricultural meteorology and transferred in 1915 from assistant in agricultural chemistry to assistant in agricultural extension, died March 17.

W. S. Taylor, formerly associate professor of agricultural education in the University of Texas and more recently engaged in graduate work at Cornell University, has been appointed professor of agricultural education beginning April 1. Other appointments include W. B. Connell as instructor in animal husbandry extension, M. D. Leonard and S. W. Frost as instructors in entomology, and R. C. Walton as instructor in plant pathology.

**South Carolina College and Stations.**—The resignations are noted of P. J. Crider, professor of horticulture and associate horticulturist, to become professor of horticulture at the University of Arizona; W. L. Hutchinson as professor of agronomy and acting chief of the agronomy division, and succeeded by C. P. Blackwell as professor of agronomy, chief of the agronomy division, and agronomist of the station; R. L. Shields as professor of animal husbandry and chief of the animal husbandry division of the station; W. A. Thomas as assistant professor of entomology and assistant entomologist; Dr. W. A. Barnett as associate professor of veterinary science and assistant State veterinarian; G. M. Armstrong as instructor in botany and assistant botanist, to engage in pathological extension work for the Bureau of Plant Industry of this Department; and L. H. Leonian as research assistant in horticulture to engage in plant disease survey work for the Bureau of Plant Industry. G. H. Collings has been appointed assistant professor of agronomy and assistant agronomist. H. E. Shiver has returned as assistant chemist of the station.

**Texas College and Station.**—J. H. Foster, in charge of the division of forestry and State forester, resigned April 1, and has been succeeded by E. O. Seicke. L. B. Burk, associate professor of animal husbandry, who has been acting as collaborating animal husbandman in swine investigations for the station, has resigned to accept a position with the Bureau of Markets of the U. S. Department of Agriculture. The station swine work has been put in charge of P. V. Ewing, animal husbandman of the station.

E. R. Spence, superintendent of the feeding and breeding substation near the college, resigned April 30 to engage in farming in Missouri, and has been succeeded by N. E. Winters, transferred from the Angleton Substation. E. A. Miller has been appointed superintendent of the Angleton Substation. R. W. Edwards, superintendent of the Chillicothe Substation, resigned March 1 to take charge of a farm in Kansas, and has been succeeded by A. B. Cron of the Office of Forage Crop Investigations of this Department.

It is reported that up to the present time an amount equivalent to over 25 per cent of the annual station salary budget has been subscribed to Liberty Loan Bonds of the various issues by members of the staff.

**Washington College and Station.**—Dr. F. L. Pickett, head of the department of botany, has been appointed botanist in the station. W. S. Robertson has been appointed assistant horticulturist.

**Wyoming Station.**—Dr. H. M. Martin, research assistant in veterinary science, has resigned to accept a position with the University of Nebraska and has been succeeded by Dr. S. H. Burnett of Cornell University.

**Association of American Agricultural Colleges and Experiment Stations.**—It is announced that the thirty-second annual convention of this association will be held at the Southern Hotel, Baltimore, Md., November 13-15, 1918.

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